REPORT RESUMES

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OCCUPATIONAL DATA REQUIREMENTS FOR EDUCATION PLANNING. PROCEEDINGS OF A CONFERENCE. HELD AT THE UNIVERSITY OF WISCONSIN, JUNE 15-16, 1965.

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A CONFERENCE WAS HELD AT THE UNIVERSITY OF WISCONSIN ON THE SUBJECT OF OCCUPATIONAL DATA REQUIREMENTS FOR EDUCATION PLANNING ON JUNE 15-16, 1965. THE CONFERENCE FOCUSED ON FOUR AREAS--(1) THE OCCUPATIONAL DATA REQUIREMENTS FOR EDUCATION PLANNING, (2) THE ROLE OF TECHNOLOGICAL FORECASTING IN THE DEVELOPMENT AND USE OF MANPOWER, (3) FOREIGN EXPERIENCE IN THE UTILIZATION OF OCCUPATIONAL DATA FOR EDUCATIONAL PLANNING, AND (4) EVALUATION OF OCCUPATIONAL DATA AND THEIR USE IN OCCUPATIONAL PLANNING. (HB)

OCCUPATIONAL DATA REQUIREMENTS FOR EDUCATION PLANNING

Proceedings of a Conference

Prepared and edited by

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U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
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The University of Wisconsin
Center for Studies in Vocational and Technical Education
1966

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PREFACE

The Conference on Occupational Data Requirements for Education Planning, (held at The University of Wisconsin, ~~Madison,~~ on June 15-16, 1965,) grew out of a suggestion from the U.S. Office of Education and was co-sponsored by that agency, and the Center for Studies in Vocational and Technical Education (funded under a grant from the Ford Foundation). The distinguished group of economists, educators, and government personnel who participated in the discussions were chosen because of their interest and continuing study in the field of the labor market and its relation to educational programs.

At least two distinct schools of thought appeared to emerge from the sometimes heated exchanges. One group felt that the need for occupational data was urgent. Information on labor demand was seen to be crucial for the successful functioning of the educational system, and especially in the field of vocational education. Such information was also seen to be essential for the successful functioning of many of the key legislative measures enacted in the "manpower revolution" of the 1960's. The Area Redevelopment Act, the Manpower Development and Training Act, the Trade Expansion Act, the Vocational Education Act, and the Economic Opportunity Act all assign an important role to education and training; and they all pre-suppose the availability of reliable data on occupational demand as a prerequisite of intelligent planning in this field. Indeed, the Vocational Education Act makes it mandatory that the Employment Service provide the vocational schools with specific occupational information.

Regardless of the existence or non-existence of new studies and projections of occupational demand, millions of dollars will be spent and daily decisions will be made in establishing training programs and vocational courses in the coming years. These expenditures and decisions will be based upon whatever labor market information may be available. The proponents of expansion of occupational demand insist that much more work needs to be done in developing area skill surveys, training needs surveys, job vacancy studies, and longer-range projections of occupational demand. While cognizant of the difficulties associated with studies of this type and aware of many of the pitfalls and drawbacks of the current efforts to forecast occupational demand, the proponents favor a greatly increased effort to improve methodology and findings in this field and to expand the total area of knowledge on the demand side of the labor market equation.

At the other end of the spectrum, an equally vocal group of conferees denied that increased efforts to provide occupational data would improve educational planning. Because of weaknesses in the methodology of current occupational studies, and because of the difficulties inherent in obtaining accurate data from employers on current and projected job vacancies, this group felt that further expansion of studies of occupational data would be a questionable investment of government funds. It was asserted that the prodigal inaccuracy of occupational forecasts would lead to inconclusive and perhaps dangerous results. Users of such projections, unaware of the weaknesses in the methodological approach to such studies, would be misled into projecting unrealistic plans in the training and education field.

Regardless of the views concerning the desirability of expanded study of occupational demand, one of the principal findings of the Conference was the extent of ignorance about the availability of current data and the uses to which existing data were being put.

Experts attending the Conference were unable to provide definitive information on the extent to which various types of occupational information are presently being utilized in the counseling of students or in the establishment of particular vocational programs and courses. Thus, one of the principal values of the Conference, from the standpoint of the Center's research program, was to focus on the need for surveys of the nature and extent of the use of occupational data by counselors and vocational educators. It is hoped that these Proceedings will stimulate other research by this Center and by research investigators at other universities into the characteristics of current occupational data, into the use of such data in counseling and education planning, and in the whole realm of the relationship of the labor market to the field of education and training.

We wish to express our thanks to all the participants and observers at the Conference; to the U. S. Office of Education for their financial assistance, and especially to David Bushnell and Sylvia McCollum of that office; to Judith S. Craig and Barbara Royce for transcribing the discussions at the Conference; to Shirley Rabideau and Mary Ann Ziegler for their typing; and to Georgie March for editing and preparing these Proceedings.

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Madison, Wisconsin
February 1966

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PART I

THE OCCUPATIONAL DATA REQUIREMENTS FOR EDUCATION PLANNING

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OCCUPATIONAL DATA REQUIREMENTS FOR EDUCATIONAL PLANNING

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It has been stated by Briggs[1] that "the basic problem in education is to ascertain what should be taught. Ideally the curriculum should determine everything—the financing of our schools, the buildings and equipment needed, and the kind of teachers employed." This statement is not quite accurate, but it may serve as a starting point for looking at occupational data requirements for education planning. Briggs assumes that society has specified its priorities and has determined the population which the school is to serve. These two assumptions, plus Briggs' statement about the paramount importance of the curriculum, are closely related to the two types of educational planning in which occupational data are of value.

(a) What should be the goals of education? The priorities which a society sets at a given time are affected by its occupations. Education for the Athenian and Spartan citizens was very different, in part because the occupations in these two cultures had such different values. DeGrazia[2] argues that occupational data can be used to demonstrate to a society that it does not have the leisure it thinks it has, and that its priorities are distorted, as a consequence of its lack of knowledge. What is the impact of work on a man's life? How should we use education for leisure to offset the "trauma of employment?" What education should we provide for the half of our society not producing goods and services? Who are the clientele of the school, particularly for its programs of adult education?

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[1] T. H. Briggs, "Research in Education," *Phi Delta Kappan*, November 1964, p. 99.

[2] S. DeGrazia, *Of Time, Work, and Leisure* (Garden City: Doubleday, 1964).

(b) What should be the curriculum of the school, particularly for education which is (and most is) occupationally related? What does the applied mathematician need to know? The physician? The bricklayer, the bellboy, the housewife? Most particularly, what does the teacher need to know? Occupational data should be able to give us answers to some parts of these questions.

These questions assume unusual importance now, in view of the unbelievable amount of money being expended on occupational education as a result of federal legislation since 1961. Wise expenditure of these funds calls for careful planning, and as Louis Levine, director of the U. S. Employment Service, says, "Occupational data represent instrumentation and panel boards for the navigation of occupational education programs."

Most of this paper concentrates on the relationship of occupational data for curriculum planning for education which is occupationally related. The principal reason for this limitation is that we know a little more about curriculum planning than about setting goals. Nevertheless, it should be remembered that occupational data can and should be useful in specifying society's goals for all of education and for determining the clientele of the school.

Another limitation of this paper lies in the fact that it is easier to be critical than to suggest feasible solutions. Too often this paper complains that *x* is not available, *y* is not used, and *z* is misused, without concrete suggestions for improvement. Too often it overlooks the very real progress which has been made and asks for, but does not design, a utopia. Perhaps the conference discussions can supply remedies.

Still a third limitation lies in the fact that the paper goes beyond those data which are strictly "occupational." Many of the data discussed are really administrative in nature. Since economists can help to decide how to collect and analyze administrative data, and since the need for them is at least as great as the need for occupational data, the temptation to mention them was too great to resist.

Let me begin by stating categorically that most education programs *do* use occupational data in their planning. Contrary to popular opinion, almost all programs of occupational education *are* planned on the basis of available occupational data and are not nearly so obsolete as many uninformed people suppose. It is true, however, that in certain places the programs are obsolete, and in almost every program the occupational data used are based on the immediate locality.

This is not the place to detail all the reasons why occupational data are not used more extensively, or why their use is so slow to affect institutional programs. It is interesting to note that if all programs of occupational education used the same occupational data for planning, and if they were all planned individually (without concern for each other), they would look much alike. Moreover, all of the common occupations would be over-represented and all of the uncommon occupations would be under-represented in the training programs.

Certain points seem clearly established regarding occupational education and the schools. Some occupational data are not collected or not analyzed; some are not available generally; some look only at the past, rather than the future; and the use of data is even rarer than their availability. Three examples from the occupation of teaching may illustrate these points:

(a) Secondary school teachers in certain fields are in very short supply, while other subject fields are overcrowded. This could have been largely prevented if occupational data had been disseminated and used. Certainly it was collected, but unfortunately, suitable presentations of data are not generally available, and those that are available neglect to this day the fact that in some teaching fields only half of the graduates actually go into teaching, while in others this proportion is markedly different. Moreover, no one forces students to use these data in planning careers, and no way has been found to keep college teachers of overcrowded fields from persuading students to keep on enrolling in their courses.

(b) Current shortages of staff members in higher education, although obviously related to the differentials in birth rate in the mid-1930's and mid-1940's and to changes in hiring specifications calling for more education, could easily have been foreseen and corrective action begun at least fifteen years ago, if adequate occupational data had been available and used. Available data do not show shortages by sub-fields. Econometricians are not in the same demand as other economists, but all are grouped together. In most analyses, all higher education personnel are treated as if they were homogeneous.

(c) Obviously, even if it were correct that everyone should be educated for use of some of their time for leisure, and that certain classes of people should be educated to spend all of their time in leisure, it would appear that, at least for the education of their teachers, occupational data will continue to be necessary. What is the future of work and leisure, and what effect should this have on teacher education?

For any given occupational program (including teacher education) occupational data obviously are of extreme importance in planning its curriculum, in designing buildings and equipment, and in evaluating its success. Occupational data may even come into account in finance: Is it reasonable to issue bonds which will be paid off in 30 years for a structure which is useful only for an occupational training program which has a ten-year life expectancy?

SEQUENTIAL PATTERN OF OCCUPATIONAL EDUCATION

Before looking further into occupational data requirements for educational planning, it may be desirable to consider the traditional sequential pattern of occupations and of occupational education for an individual. You will note that the sequence outlined below involves much more than those courses commonly thought to be "vocational." It applies to professional education, and often even to majors in the humanities, when we consider the purposes for which students pursue a particular type of education:

(a) Pre-occupational programs (of many different types including reading, industrial arts, and college-level survey courses)
(b) Occupational programs for entry jobs
(c) Entry jobs (on-the-job training)

(d) Occupational programs for
    (1) maintenance of improvement of skills
    (2) promotion
    (3) horizontal job changing
(e) Advanced jobs (on-the-job training)
(f) Pre-retirement training
(g) Retirement

This pattern is clearly sequential, with (a) frequently leading to (b), (b) frequently leading to (c), etc., though many people begin the sequence at point (c). Points (d) and (e) may be expected to be repeated several times. The training may be given in schools (public, private, and in-plant) or on the job. It may be formal, informal, or a combination, as is typical in certain types of apprenticeship. Theoretically, guidance is available throughout this process, but most jobs and educational institutions (like wives) are selected on the basis of convenience.

Each stage has an input and output, and the persons who are the output at a previous stage become a potential input for the next. Sharp changes in occupational goals brought about by unemployment or altered occupational interest may interrupt the sequence and require dropping back to stage (b) or even to stage (a).

The above sequence might seem to assume that a person holds a single job at one time. Obviously, however, many people hold two or even three jobs simultaneously: just ask any fireman, cab driver, or male teacher. Should we provide formal training for these secondary or tertiary jobs, when they are not the same as the primary ones? Obviously, many workers are in stage (e) for one type of employment and in stage (c) for a secondary job, but we do not know how many, because such moonlighting is not reported accurately. It is generally assumed that a secondary job is the same as the primary job or is so unskilled as not to require training. Many people, however, anticipate their occupational obsolescence by "stealing a trade" through moonlighting. Certainly this is a wasteful procedure.

Most criticisms of outmoded occupational education have concentrated on those programs at level (b) which are highly unlikely to result in employment at level (c). There has been relatively little criticism of the quality or pertinence of training programs at other levels. Criticisms have, instead, centered on their lack of availability.

Unfortunately, we know very little about this sequence, about its description, prediction, or control. Occupational data and economic analyses would help greatly to supplement the available literature on occupational choice. If these data are really used, they are certain to lead to considerable modification of the traditional sequence, with the greatest change probably occurring in continuing (adult) education designed to supplement on-the-job training and thus meet the higher technical requirements of emerging jobs.

TYPES OF OCCUPATIONAL DATA REQUIRED

For discussion purposes, it may prove useful to establish two major categories of occupational data, even though there is considerable interaction between the categories. The Department of Labor has traditionally concentrated on occupational data related to *demand* for certain types of occupations. They have developed certain of these types of "social bookkeeping" to a sophisticated level, but other types (e.g., job vacancy studies) have been plagued by numerous unsolved problems. The second category, that of *supply* of trained personnel, has received much less attention. The U.S. Office of Education (USOE) regards this as their preserve, although Labor and other government agencies are beginning to poach upon it. Perhaps some day we will have a department of Education and Training, but it is probably too much to hope that supply and demand data can be gathered and coordinated there. According to the USOE, twenty-five different federal agencies are concerned with occupational education, and they are unlikely to abandon their interest.

Generally, data on supply have been even less adequate that those on demand. For that portion of the supply which comes from schools, this has been due in part to a lack of leadership in the USOE, but a much more important factor has been their reliance upon voluntary data collection by the states, which in turn depend heavily upon voluntary collection by local educational agencies. This voluntarism has been carried so far that many types of data are collected in entirely different ways in different states and cannot be combined in any meaningful way. To take a specific example, we do not know to this day the number of graduates in any one year from any particular type of federally reimbursed vocational training program. Obviously, the problems are even greater in getting information on supply from private sources or from non-federally aided public programs.

For that portion of the supply coming from sources other than school-related programs, data are even more inadequate. The situation is so bad that social bookkeeping by professional organizations such as the National Education Association are considerably more accurate and more useful than those data collected by the federal government.

A brief paper, "Administrative Statistics on Retraining," by Frederick W. Suffa, Office of Manpower, Automation, and Training, offers an interesting contrast between the potential wealth of data collected for MDTA programs and data available for federally reimbursed vocational training programs, as expressed in such publications as the USOE digest of annual reports of state boards of vocational education. Yet, even these MDTA (and almost all other) occupational data are collected by the proverbial unlettered, unmotivated town crier. Moreover, no information is obtained about those persons who were not selected for training, though a study is under way to gather data on this aspect of the training program.

The Census has long supplied more or less accurate information about the number of people unemployed and the number employed in each occupation. This tells us something about supply, if we assume that those employed in an occupation are qualified. It tells us something about demand, if we assume that those retiring will be replaced by others in the same occupation. It tells us something about the excess of supply over demand, but little about the qualifications of those people who make up the excess.

There are, of course, interactions between supply and demand. Increasingly, the supply of scientists and engineers determines the rate at which innovation is likely to occur. This, in turn is supposed to affect the rate of economic growth and, hence, the demand for certain types of manpower. In reverse, advertising and education are believed to affect demand for certain services, which affects the available supply of people who can render the service. We know surprisingly little about these interactions.

SUPPLY

On the supply side (of what hopefully, someday, will be an equation which balances within three percent), we need a considerable amount of information which is purely of an administrative nature, as well as occupational data *per se*. We need information on the student who may be a potential enrollee, on the student who is enrolling, and on the student who is in a program of occupational education. This should include data on abilities of various types, on interests, and on achievement levels in different fields. It is interesting to note that, in spite of increased cooperation between the Employment Service and local vocational programs, norms on the General Aptitude Test Battery are quite inadequate for high school age students.

No one has really solved the problem of measuring interest. Little work has been done on relationship of achievement in occupational education to occupational success. While some information is available on male versus female, on white versus non-white, and on age, we have practically nothing on groups categorized by marital status, physical condition, language, religion, or the perhaps equally potent minority distinctions between different types and levels of intelligence and different types of interests.

What is the effect of overtime work on occupational education? We need to have a considerable amount of data about skills as they relate to occupations. Presumably, there are clusters of job skills and families of occupations and "fields of work." We know very little about them. Perhaps the most crying need for research in occupational education is on the transferability of skills, as related to horizontal and to vertical mobility within the labor force.

We do not have adequate studies of the cost of various types of occupational programs, let alone studies of differential economic efficiencies within this type of education.

Where do vocational teachers come from, and how are they trained? We need considerable information about the graduate. Donald Super's work is still a cry in the wilderness. For trade and industrial education graduates, studies show a typical placement figure of 60 percent in the occupation for which trained, if the student has been involved in a program operated entirely within a secondary school. This rate of placement jumps to 80 percent for part-time cooperative trainees. We have no such information on business education graduates, though, presumably, the figures would be roughly comparable. Data on home economics and agricultural education graduates are non-existent since educators in these fields feel that such placement information is "misleading."

We need information on drop-outs from occupational programs. We know that drop-out rates are higher in occupational programs than for certain other types of school programs at the secondary school level, but no one has really studied the drop-out from occupational education. What are his characteristics? What would exit interviews reveal? What would follow-up studies reveal? (A study of freshman men at the University of Illinois,[3] completed in 1962, would indicate that follow-up studies should cover an extended period of time. Contrary to earlier short-term studies, this ten-year study showed 70 percent of freshmen completing college within ten years and a sizeable proportion still working toward graduation at the end of that time. The ten-year rate of graduation was well over twice the four-year rate.)

The wealth of information available from Project Talent (American Institute for Research, University of Pittsburgh) remains virtually unmined. Data were collected on a carefully stratified five percent sample of high school students to show the type of school program in which the student was engaged, information about his social and economic status, his abilities, his interests, and many other factors. A person concerned with the supply side of occupational education could extract a great deal of worthwhile information from this data bank

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[3] B. C. Eckland and Anita C. Smith, *A Follow-up Survey of Male Members of the Freshman Class of the University of Illinois in September, 1952* (Urbana: Office of Instructional Research Report 105, 1963).

(which depreciates in value each year, as it gets further and further out of date).

With Ford Foundation support, the American Institute for Research has been making a comprehensive study of a relatively large number of secondary school occupational education programs. Results were to have appeared by now. When they are available, we should know much more about the supply of occupational education than we have ever known in the past, but, of course, we will still know virtually nothing about on-the-job training.

We need information on the evaluation of programs which goes well beyond such a gross measure as the proportion of students placed in the occupation for which trained. This latter measure, presumably, is affected greatly by the availability of jobs, and may conceal gross inadequacies in training. This measure is also undoubtedly affected greatly by the quality of the student input. Given a student of high enough ability, very satisfactory placement rates can be achieved with almost any sort of training. It seems reasonable, however, that occupational training programs which show zero placement in the occupation for which trained, and which report this year after year, are apt to be deficient in planning, training, placement, or follow-up.

What we really need for an evaluation of occupational education is a new measure which is similar to the "value added by manufacture." It might be called, "value added by education." Occupational programs which start with poor trainees and end with good workers may be considerably more important economically and socially than programs which start with good trainees and end with excellent workers. At the present time, we look only at the quality of graduates and therefore conclude that the junior college technical education program in the suburbs is better than the vocational program in the core of the city.

DEMAND

Because a great deal more work has been done in this field than in supply, the picture of what is available and what is needed is considerably clearer. We are beginning to acquire reasonably accurate information on long-term trends in numbers of workers needed in various occupations. We have considerably less information on changes in job demands and still less information on current job vacancies of various types. Early warning systems on occupational changes are in the process of development.

Demand information is much more satisfactory for manufacturing occupations than for service occupations, for large industries than for small industries, and for large enterprises than for small enterprises. Ideally, demand information should consider not only what is, but what can be, since availability of education affects change in the content of jobs, the proportion and the distance of geographic mobility, the amount of occupational mobility, and a whole host of other variables. Demand information should take into account not only what types of employees are *desired*, but also those that can be used. The Air Force studies on effective utilization of their entire range of available recruits should be taken into account in civilian occupational data collection. It would be highly desirable to know how economic conditions and how supply and demand affect employers' willingness to utilize people who are less able than desired. A useful foreign study might be conducted in Japan, where large industries usually have first choice of the available employees, while small industries take what is left. How does this affect training methods and job assignments?

Demand studies should take into account the information that we have on the preferred band or range of worker ability which is different for each occupation, but in each case is closely related to length of job tenure, to accident rate, and to many other factors related to success on the job. Does this band of abilities change with economic conditions and supply and demand? Why is the band of abilities much wider for certain sorts of occupations than for others?

What is the effect of minimum wages on demand for youth and unskilled adults? What is apt to be the effect of income maintenance programs on occupational education?

We need information on the social effects of changes which have been made by industry and education. Certain changes are economically but not socially justifiable, and *vice versa.* Unfortunately, we don't know much about this problem, since economists and sociologists don't communicate.

VALIDITY AND USEFULNESS OF OCCUPATIONAL DATA

Those occupational data which are available suffer from numerous deficiencies, some of which are inherent in their collection, and some of which arise during interpretation.

Incorrect Data

This is not the place to criticize census procedures. The Census Bureau are well aware of the need for well-trained, well-motivated collectors of data and of the advantages of appropriate sampling procedures. We can even sympathize with their problems in dealing with the bathtub manufacturer who wants to have more data collected more frequently for him.

Most data collectors are aware of a need to establish conditions which will enable the respondent to supply data which is unbiased by his aspirations and prejudices. These data collectors try hard to keep the janitor from claiming he is an engineer or the high school drop-out from claiming he is a graduate. They are not entirely successful in avoiding these distortions, but they try hard.

It would appear, by comparison, to be easy to pre-test questions to see if a person *can* answer them with accuracy. Nevertheless, a recent survey asked people to list the amount of vocational education they had received. We know that students who have been enrolled in a nine-week junior high school unit in drafting feel they have been thoroughly prepared for a drafting position through a vocational course. A recent survey of vocational school graduates (at least, it had been ascertained in advance that they *were* vocational school graduates) asked these graduates to list the amount of time they received instruction in each of several phases of the occupation. Almost certainly, most answers were pure guesses.

Regional variations and rapid changes in job content and job titles make it mandatory that we increase the frequency of observations and interviews at the job site. Data collected from a personnel manager of a large concern may be completely inadequate, even for his own company. Certainly, we know that his answers will be very different from those given by the president and the foremen of the same company.

Data from the Wrong Geographic Base

Grant Venn[4] points out that occupational education, now more than ever before, must establish a firm and continuing relationship between its students, its programs, and the world of work. Only a few years ago, Kahler and Hamburger[5] were castigated severely for attempting to lay the groundwork for such a relationship between the schools and occupations. They said simply that society (U. S.) needs *x* people for occupation *y*; therefore, society should prepare *x* people for occupation *y*. Although their rationale was not given as completely as that of Venn, their approach should be regarded as a pioneer step in relating occupational education in schools to something more than local needs.

Profit-making industries have long had a very parochial approach to occupational education. If they are large enough to support a training program, they are committed to "providing that training and only that training which is required to bring an individual up to a level of performance which will produce profit for the company." If they are too small to support a training program, they will endeavor to entice from other employers the workers who have those skills required by their immediate employment needs.

Most occupational education in educational institutions, especially at the secondary school level (both in school and for adults), has had a similarly parochial goal. The wave of local occupational surveys in the early 1920's, which followed the birth of federally reimbursed vocational education, has been renewed at periodic intervals. Whenever local community pressures became intense, because of a perceived lack of correspondence between the vocational education program in the schools and the needs of local industry, another local occupational survey would be completed and more or less sweeping changes introduced. Thus, for example, a large city on the West Coast discontinued its hand-forging shops in 1950, and another large city in the East finally retired large numbers of hand-operated, wood-turning lathes in the mid-1950's. A very large city in the Midwest to this day incorporates no instruction in lithography in its printing classes. Perhaps this community will institute a local occupational survey in the next ten years and will retire certain of its letterpress equipment in response to it.

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[4] G. Venn, *Man, Education, and Work* (Washington: American Council on Education, 1964).

[5] A. Kahler and E. Hamburger, *Education for an Industrial Age* (Ithaca: Cornell University Press, 1948).

George Beal of Iowa State says that rural people must migrate geographically *and* occupationally. However, most secondary school vocational education programs and several federal programs (notably under the Area Redevelopment Act) are committed to bringing jobs to the people, so that they will *not* need to migrate geographically and perhaps not even occupationally. Politicians who want to preserve votes join with citizens who want to preserve communities in supporting such programs.

Programs based on regional occupational data are much more likely to concentrate on preparing people to move to available jobs. An interesting example of this is a vocational machine shop program in a small resort community in north central Indiana which has never placed one of its graduates in a local machine shop, for the simple reason that the school machine shop is the only one in that locality. Instead, graduates of the program move to Fort Wayne, Anderson, and, until recently, to South Bend, where they readily find jobs as tool and cutter grinders. This migration has occurred, not because regional occupational data were available, but because the teacher happened to have skills which happened to be in demand, and he happened to know where they were in demand.

Area vocational schools, technical institutes, and colleges of all varieties know that they need information from a source broader than their immediate vicinity. Secondary school programs for teen-agers and adults are not convinced of this need, generally.

A rather typical example of the results of local determination of occupational offerings is contained in a survey of more than 3,000 public high schools:

Offering	Percentage of Schools Offering Different Types of Occupational Education, by Population of Community 2,500	 2,500-30,000	 Over 30,000
Agriculture courses	49	50	16
Trade and industrial courses	2	14	31
Distributive courses	0	5	27

Kahler and Hamburger were generally correct in pointing out the need for a broadened base of occupational data which could be used for educational planning. However, their nation-wide base was probably too large for most occupational education programs, though it certainly would be better than relying upon purely local occupational data. Almost all curriculum decisions for vocational education are made locally. If these decisions are made on national data, they are likely not to get local support. If decisions are made on local data (which is usually the case), the result is parochialism.

The real need is for regional information. It would appear that the extent of the region should be defined by mobility. Obviously, mobility is not the same for all occupations; therefore, regionality is not the same for all occupations. For certain types of highly technical occupations, the region probably should be the entire United States and perhaps the Free World. For other types of occupations, perhaps, it should be a small section of a city. Without this regional information, educational planning is extremely difficult.

Collection of Data Which Defy Analysis

We often warn our students against this error, but are remarkably susceptible to it ourselves. Perhaps the most common error is in using categories which are too gross. Gross employment and unemployment statistics and gross school drop-out statistics are far less important than their components.

An equally serious problem is collection of data which cannot be treated by multivariate analysis. This type of analysis requires some commonality among the data. With different agencies collecting data from different samples at different times, any commonality occurs by chance. This leads to the spectacle of highly respected economists who are apparently unaware of the interaction between unemployment of youth, unemployment of persons who have never held a job, unemployment by level of education, and changes in the age composition of the labor force.

Similarly, education is stated flatly to be more important than experience as a determinant of pay, with no consideration of the interaction between selection factors which are inherent in both education and experience.[6] There are few, if any, fields of science where interactions are so little studied.

Results of Absence of Data or Absence of Use of Data

While it is relatively easy to decry the lack of highly desirable information on both the demand for and the supply of skilled manpower, it is only fair to point out again that we are not using effectively the data we have at hand.

An interesting example of a failure to utilize available data in administrative decision-making is found in a study by Harold Smith.[7] He shows that, of the six types of vocational education subsidized by the state of Michigan, using federal funds, agricultural education has a rate of reimbursement for teacher's salaries which is markedly higher than that in the other programs, and, moreover, its rate of reimbursement has been reduced less over the past twenty-five years than that in any other field. Presumably, the quantitative needs for agriculture education are being met much better than those other fields, yet an administrative policy encourages agriculture education to a considerably greater extent than other types of occupational education. Certainly, this example applies to many states other than Michigan.

An example of a different type of failure to use data is the excellent report prepared by McLure.[8] This report itself

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6. B. Clark, "Economy: Change and Renewal," in H. Ziel, ed., *Education and Productive Society* (Toronto: W. J. Gage, 1965), p. 37.

7. H. Smith, *Education and Training for the World of Work* (Kalamazoo: Upjohn Institute for Employment Research, 1963), p. 35.

8. W. McLure *et al.*, *Vocational and Technical Education in Illinois* (Urbana: Bureau of Educational Research, University of Illinois, 1960).

used occupational data which clearly established the need for certain types of occupational education in Illinois. While certain parts of the report are being implemented, it seems clear that, in some cases, decisions based on local political considerations are more important than decisions based on occupational data.

In the absence of data or in the absence of the use of data, certain types of occupational education are remarkably resistant to change, in spite of rapidly changing occupational requirements. Pucel and Evans[9] discuss the relative susceptibility to change on the part of different types of occupational programs and the principle of acceleration as it affects occupational training. Unfortunately, neither part of this article could be based on actual data, because they were not available.

Long teacher tenure, which leads to instruction continued long past the time that it is needed; small schools with locally determined programs or no programs at all; inadequate dissemination of data; resistance to innovation; and divided responsibility and authority for educational programs all contribute to less than adequate utilization of presently available information. It seems highly desirable that a search for new and improved sources of occupational data go hand in hand with investigation into more effective use of presently available data, if we are to make optimal progress. When you consider that occupational education in secondary schools and in higher education provides one of the very few places where public policy can affect significant changes in direction (rather than amount) of economic change, intelligent use of data becomes imperative.

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9. D. Pucel and R. Evans, "Manpower, Economics, and Vocational Education," *American Vocational Journal*, XXXIX, No. 4 (April 1964), 18-22.

DISCUSSION

VICTOR FUCHS
NATIONAL BUREAU OF ECONOMIC RESEARCH

There are a number of points in Dean Evans's paper that I am in agreement with: the importance that he attaches to continuing (adult) education, and his call for research on the transferability of skills, i.e., the notion of job clusters. With respect to the latter point, I have a suggestion. We've spent so much time looking at the unemployed; let's take a look at people who are *working*. Let's look at people who have good jobs and find out how they got their jobs, what sort of training they did or didn't get, and how they qualified for the jobs they now hold.

Another point of agreement concerns the importance of the work of students as an input in the "production" of education. If you are interested in productivity in education, then you must look at the output in relation to the input. Clearly, one of the most important inputs is the student. If you put in one of high quality, the chances of getting more output are much greater; but that doesn't mean that your productivity is higher. Also, I very much agree with the statement that effective use is not being made of the data now at hand.

There is another point that I'm in agreement with—the importance of education for leisure—but I would prefer to state it somewhat differently. Dean Evans uses the conventional work-leisure dichotomy; by work, I assume he means any production that takes place in the market where a person receives compensation, and by leisure, everything else. But there's a great deal of productive activity taking place outside the market which might be called home or non-market production. To call what a housewife and mother does leisure, and to call what we are doing here this morning work, is to reverse the common-sense meaning of these terms. With shorter hours, more vacation, longer retirement periods, and so on, I think we will find that, increasingly, a larger fraction of productive activity (the creation of goods and services and utilities) is going to take place outside the market. Therefore, when we talk about occupational data requirements, we should have this type of productive activity in kind, as well as work in the market.

The main thrust of the paper, it seems to me, is a call for more and better data, and here I must register some disagreement, or at least raise some questions. As a user of data in wholesale quantities, it is tempting to say, "yes, of course." Surely, our research would be made easier and more interesting if we had more numbers to play with. As an economist, however, I feel obliged to ask about the cost of obtaining and using these data, because there will be a cost.

Also, what will be the benefit? How will these data be used? Dean Evans implies that things would be a lot better if we had the additional data. This is, in my judgment, an unproven hypothesis. I wonder whether the problems that we're concerned with—unemployment and poverty—can be blamed in any significant way on a lack of occupational data? The problems of teenagers, of Negroes, of depressed areas, of rural poverty—these are the things that concern us; these are the important questions; these are the things that make us interested in vocational education and other possible solutions. And the connection between these problems and the lack of data is not entirely clear to me.

Of course, if the only thing involved was some waste of resources in collecting data, the loss would not be great. It seems to me, however, that there are greater dangers, that this emphasis on occupational data requirements may obscure more fundamental causes. We may convince ourselves and others that these problems can be traced to our lack of knowledge about occupational requirements, when actually they may be the result of other shortcomings.

For example, there is the importance of the adequacy of aggregate demand. If aggregate demand is insufficient to provide a reasonable number of jobs, we should focus on this. Also, there's the possibility of rigidities and distortions in labor markets. We can't just look at what is taking place currently in the labor market and take that as given. If we are going to talk about supply and demand, we must do so in the schedule sense; what supplies would be forthcoming, what demands would be forthcoming, at different wage rates? Furthermore, we musn't neglect the importance of attitudes and work habits and general intelligence relative to specific skills.

I would like to put forth the following propositions deliberately in a provocative and somewhat overstated form in order to stimulate discussion. (1) The basic problem is not "wrong" skills, but *no* skills. (2) Most entry jobs do not require long periods of prior training in specific skills. (3) Most employers expect to provide some on-the-job training, and some employers actually prefer to teach specific skills themselves. (4) Every employer wants workers who are dependable, punctual, honest, willing to do a full day's work, and able to get along with other workers and supervisors.

The foregoing should not be interpreted as ruling out the desirability of vocational education. On the contrary, I think there is a big job for vocational education to do. At the junior college level, for example, excellent work is already being done at a number of places, and the principal problem is to expand facilities of this type. (In passing, one hears very few complaints from the successful schools about lack of data.) At the high school level the actual subjects taught may not be so important, but the existence of a strong vocational education program may hold the student in school, may give him better work habits and attitudes, and may help to make general education more meaningful and palatable.

Vocational education can also be of critical importance where the worker has very little else to recommend him. For example, in New York City there is a vocational training program for inmates of the New York City prisons. Many of these inmates are drop-outs from school, many have a record of drug addiction, and many suffer from racial discrimination. If they can be taught some specific skill that is in demand, their chances of obtaining employment after leaving prison are probably increased greatly. But notice the kind of information that is needed. It has to be very specific with respect to the particular locality, the particular trade that the boy will enter, the union connections that are needed, and so on. This type of information can hardly be provided by a federal or state statistical service. It has to be tailor-made to the particular situation.

Of course, there is always room for improvement in data collection and dissemination, just as in any other field, but we already have a good deal of information. I would like to close with a reformulation of Dean Evans's opening quotation. He wrote, "The basic problem in education is to ascertain what should be taught." I would say the basic problem is to ascertain what should be *learned*, and that we already know a large part of what employers want. What we don't know is *how* or even *if* it can be taught.

JACOB J. KAUFMAN
THE PENNSYLVANIA STATE UNIVERSITY

The title of this session is "The Occupational Data Requirements for Education Planning." I would have preferred to reverse the title, to "Educational Requirements for Occupational Planning," and shift the emphasis. It seems to me that, if I could use a rather strong word, we might reject the idea that we really can project occupational needs and instead adjust the educational process to meet these needs.

First, not only is it difficult to make projections, but almost impossible in a market economy, in which the variables affecting these plans are so unpredictable. We are operating in a national market, and the decisions with respect to many occupational needs are made in local areas. Second, it seems to me that attempts to make projections go contrary to the prevailing values of our society, which insist that each individual should seek out his own place in the community.

Third, somehow the whole idea of making projections, and fitting students into these projections, is contrary to my idea of the real role of education, which is to provide the fullest and widest opportunity for each individual to fulfill his own desires and needs.

Finally, the emphasis on developing data for the future takes our attention away from an examination of the weaknesses of the educational process in the preparation of youth for occupations, where I think the main emphasis should be. We ought to re-examine the whole approach to the training of people for work in society. We might then find the need for data would tend to disappear.

There is a tendency to talk about two types of training in our high schools. We talk about vocational education and an academic program, the latter being essentially the preparation of students for college.

There are actually three types of programs. One is vocational education, which is a narrow, specific type of training for a certain type of skill. The second is an academic program, training youngsters for college. But there is a *large* third group which is ignored but can be described as "general curriculum education." This curriculum consists of a few bits and pieces of academic training, a few bits and pieces of technical training, and a hope that the students will either leave school or leave the teachers alone. This group is ignored by our society, and ignored by the vocational educators. In fact, on hindsight I think that the Vocational Education Act of 1963 was poorly named; it should have been called the Occupational Opportunity Act of 1963. Then we would not be concentrating in the vocational education field but greater attention would be paid to this other group which is really getting *nothing* out of our school systems.

It seems to me, further, that in vocational education we *are* not and *should* not be training for occupations. *First*, we should be training for occupational clusters, rather than for specific occupations. This training for an occupational cluster should be considered a means and not an end. When you train youngsters, say, for auto mechanics, you are in effect training them for many occupations. And what you should do is use auto mechanics as a motivational force to interest the student, as a means by which you will train him for many of the skills and disciplines that are necessary on the job.

In this field of general curriculum education that I've referred to, I think we are *completely* ignorant of the problem, and, I find that there are no curricula available for them. There are a few communities that are experimenting in these directions, but I would like to see it receive major emphasis.

It seems to me, further, that there is a need for a thorough overhaul of the entire occupational-educational process, which, if successful, would really reduce the need to make projections. For example, as I mentioned before, vocational education is looked at too narrowly today. Actually, as has been indicated, it does do an effective job in the narrow sense. But in many areas, it's a rather exclusive operation. You must be admitted to a vocational education program. The entry requirements at times may be as difficult as that for the academic program. And though it's considered by some people as being a rather second class education it really is not that at all. The placements are excellent, if you look at placements as an index of success.

What I would like to see is an emphasis on the development of programs to meet the needs of young people, in order to provide them with opportunities in the work that they may go into later on in life. I have the strong impression that the problem may well lie in the early years of schooling; if we would approach it there, we might solve the problem of what to do in the secondary school, and even of developing education for occupational needs.

It seems to me that there are certain areas of study that might be considered. For example, as John Dunlop pointed out, what do we know of the actual job market situation in terms of individual firms? Though there's a notion of this in Dean Evans' paper, Dunlop has referred to this port-of-entry concept. Perhaps all we need to do is train people for their first job. What are the needs of employers for this opening job? And here, it seems to me, we ought to be training people, or even developing projections, if we wish, in terms of raw job content, rather than specific occupations within a matrix, as Dunlop suggests, of certain job families. If we set up a broad matrix and do the job which we should be doing in the schools, we might really be able to fit people to a society which is constantly changing and to which they are adaptable.

On the other hand, I heard someone say that this is all very well and good, but he envisions a youngster who got out of school and when asked by an employer, "What do you know," replied, "I know nothing, but I am adaptable and flexible." I'm not quite sure whether he would get the job. We know very, very little about vocational choice; how do youngsters really make a decision about the occupations into which they go? It may be very closely related to the family environment from which these children come. If something could be done within the family environment, maybe then something could be done in terms of vocational choice and vocational decisions. Al Blum of Michigan State mentioned that in order for children to have a future, they must have parents who have a past; perhaps the solution might lie in some work that must be done with their families.

We know very little about the effectiveness of our programs. Carl Schaeffer and I are hoping to determine something about this in our current research, not solely in terms of job placement immediately after the training that was received in school, but in terms of what happens to these young people several years after they've been placed, the extent to which they will stay with the job. We shall have the opportunity to ask the graduates of the various programs to evaluate the training that they received. Furthermore, we shall attempt to get from supervisors and employers *their* evaluation.

To summarize, what I really have done is to rearrange the whole question by asking what should be the education requirements for vocational training. Perhaps we are concentrating in the wrong area.

EDWARD J. MEADE, JR.
THE FORD FOUNDATION

We do not have, in any recognizable form, an efficient system of getting what little information we have about occupations into the hands of the people who determine the educational programs of schools. You only have to visit schools and hear teachers stumble their way through a description of the jobs that exist outside the school—sometimes just across the street. For example, teachers usually have a description of a fireman which is not true. Generally, it is one romanticized by some publisher or other. When we move to the level of the technician for tomorrow, we generally describe the technician of yesterday. If this meeting accomplishes nothing more than to provoke some of the people who are interested in systems and efficiency to find effective ways for the schoolman to understand what little information we have, we will have had a successful and productive meeting.

I am very concerned about the information lag, because it provides just one more excuse for schools not to do what society hopes they can do. I work on a street that is infamous—Madison Avenue. I sometimes think that the Ford Foundation is out of place there; at other times I think it may be the right place for it. Nevertheless, we can learn from our advertising neighbors on Madison Avenue. They manage to know quite a bit with regard to their market and what to do about it. In education, we really do not know very much about our market or even how to determine it. Jacob Kaufman says we should create the market, but we cannot even manipulate the present one. In education we cannot create the market, much less know what it already is. What can we do about it?

First, we should provide some sort of vehicle or mechanism so that whatever occupational information is now being collected—and it is being collected by a variety of sources—could get in the hands of the people who have to make decisions about educational programs.

Second, we should correct misinformation. The best information that schools have now is about other schools. Most guidance has become placement—college placement. I would like to be the principal of a school for awhile, so I could post the batting averages of the guidance counselors—7 out of 10 in the Ivy League, 4 out of 6 in the Big Ten, etc.

Unfortunately, we do not have adequately trained people who understand the nature of the vocational information they are dealing with. We over-generalize, because schools have to be general in their orientation, but we do it to the detriment of the student. It might be useful if we attempted to miniaturize the world of work in some fashion, thus exposing children to vocational information first-hand, rather than having it translated by teachers who cannot be expected to know it all.

Victor Fuchs and the other speakers have discussed the kinds of information needed for educational planning. I can only underscore their thoughts with a couple of strokes. It is obvious that most of the data we use in schools are statistical in origin; such data do not have any of the qualitative aspects I think are necessary.

For example, most schools have a job description of a plumber that is based on a resource document, the *Dictionary of Occupational Titles*, as one illustration, and that is what a plumber is, as far as the schools are concerned. In most schools, that is all the child will ever learn about a plumber. He does not know that in some cities in order to be a plumber you must be the cousin of another plumber, or in another town you have to have a white skin, or in a third place you must go through six or seven years of apprenticeship and then slip $50. 00 under the table. In some cases, if you are a plumber in one city, you cannot work in an adjacent city because it has a different set of requirements.

I am bothered by the fact that our vocational information is so limited. We can tell students so much about the University of Wisconsin—its lakes, its extracurricular activities, its faculty; its curriculae, its folklore, its traditions—but the poor kid who wants to be a plumber knows little more than that a plumber uses a wrench and a few sets of pipes. We need to develop better ways and means to get at more kinds of relevant information, some of which does not fit designs, does not fit a perspective, perhaps, for it is a little muddy. Instead of a statistical, or a sociological, or a cultural, or an anthropological, or a you-name-it approach, we need a multi-disciplined approach to collecting information. Dean Evans made a case for more relevant information. He talked about a need for getting closer to the job and knowing about the reality of the job in order to collect such information.

This fall, there will be an attempt to approach the collection of different kinds of data on occupations. Presently, five state departments of education are conferring about career information for youngsters. The states of Arizona, Colorado, Nevada, New Mexico, and Utah are embarking on a program of providing more vocational-educational opportunities for youngsters in rural schools. One of its refreshing features is the development of a "career service agent," whose responsibility is to collect information about occupations in the region of the rural school and then to help develop opportunities for youngsters to learn more about these jobs.

Rather than rely solely on the schools, he is going to see how industry and other community services can be used to train and to educate rural youngsters for vocations. The reason is obvious: small rural schools can never be expected to maintain elaborate vocational programs. Perhaps in some way, this program will get at what Dean Evans was alluding to, and that is to collect information on occupations in all aspects, not just their functional aspects, and on ways by which you can relate them to the entire community.

I have a friend who works in the garment industry in New York City. Anyone entering the garment industry who goes in with only a functional analysis of that industry is crazy—he would certainly be broke in a few days, because there is a great deal of tradition and culture in that industry and, if you do not understand it, you do not function.

If we could clear up the information lags and gaps, if we could help people to understand what information now exists, and if we could then develop more information, the next step would be what to do with all this information, once we have it.

I would like to plead that when we translate these data, we siphon off what the analysis offers for the role of industry, the role of training programs, and the role of schools. The school is limited; I do not believe that it is the catch-all of society's training needs. Schools can only provide a part of what needs to be done in vocational training. These data should be processed through some sort of filter, and at the end of that filter, the school should adopt only what is relevant to its general orientation, its general program.

Certainly, if the school can use its vocational programs to train for a cluster of skills, it would be useful. We talked a great deal about clusters of skills, families of skills, yet we have never developed an appropriate way of identifying them. This beautiful phrase offers a panacea, but once we look into it, we really do not know what those skills are. When we do, then the schools might do a better job of educating the youngsters, particularly those youngsters in the so-called "general" programs of secondary schools. The general program they presently get is a cafeteria of unlimited courses, some specially created, others watered down from academic programs. Such programs might include a course in typing, a course in business mathematics, a course in commercial English, a little bit of Latin, a little bit of calculus, and so on. It all comes out as the general curriculum. That is what many of our youngsters must put up with in school.

We even have shut these youngsters off from a number of vocational programs. Vocational educators learned early in the game that the way to increase quality is the way the college professors have been doing it for centuries—raise the standards for admission so that only talented students can enter. Many of the vocational programs, as well, only want quality. What do we do with "non-quality" people? We could do something with them, if we first had adequate data with which to cope with their future and set about to design relevant and respectable programs in which they could succeed.

What I have tried to stress here, from the viewpoint of an old schoolteacher, is this: (1) we should cut down the amount of time elapsing from the collection of information to its application in the schools; (2) we need to collect the significant information that exists; (3) we need to expand the kinds of information we get to more than just statistical and functional analyses; and, (4) we need to adjust our programs as these data relate to the general education offered in schools.

SOL SWERDLOFF
BUREAU OF LABOR STATISTICS

In his thoughtful paper, Dr. Evans has discussed many of the important occupational data needed for educational planning. I would like to comment briefly on a few points included in his paper and perhaps discuss some other data needs.

Before going into specific data needs, I think there should be an assessment of what is already available today and where the greatest needs are for educational data. We are not starting from scratch; there already exists a great deal of occupational data that is useful in planning education and training. This was brought home to us when we were developing a report called "Counselor's Guide to Occupational and Other Manpower Information," which was an annotated bibliography of selected government publications. Perhaps because they are not in the form to be best utilized, or because they have not been brought to the attention of people who might use them, or for some other reason, I am sure a great deal of this occupational information is not being used at the present time.

There are several specific aspects of data needs in the Evans paper on which I would like to comment. First, I certainly agree with him when he discusses the lack of basic statistics. At the present time, little information is available on the number of people completing particular types of occupational training programs, whether it's vocational schools, technical institutes, or training programs in industry. Much more data are needed to tell us whether the graduates of these training programs obtain jobs in the field for which they have received training.

Dr. Evans indicates the great amount of information available from the decennial Census, which gives the number of workers employed in each occupation. However, he then comments on the difficulty of obtaining accurate occupational statistics from individuals and recommends that more data be collected at the job site. We are all aware, of course, that the Census does provide a great deal of detailed information on employment, unemployment, earnings, etc., by occupation. However, the decennial Census data is at least 2 years old when we first see it and 12 years old by the time the information for the next Census becomes available.

It has been fairly well established that you are likely to get a better classification by occupation from employers than from the worker himself or his wife. It might be worth while to mention at this time that the Department of Labor is at present attempting to develop a program to obtain current employment statistics by occupation. In this program, now in the pilot stage, surveys would be made of employers to obtain occupational distributions of individual industries which, when combined with statistics on total employment by industry, would provide up-to-date employment statistics by occupation.

If we are going to meet the growing need for occupational data, we need to know much more about demand by levels of training within an occupation. In the professional group, how many must have a master's degree or doctor's degree? For the skilled crafts, what proportion of the workers must have apprenticeship or other formal training? What are the requirements by sex or age? How are the skill requirements in individual occupations changing? In evaluating demand, how much do we have to know about related occupations and transferability of skills? What must we know about the effect of supply and demand for workers, in assessing the probable substitution of one occupational group for another, such as technicians for engineers?

Up to now I have been emphasizing employment growth. However, for many occupations the need to replace workers because of death, retirement, or transfers to other fields are much more important than growth with regard to the number of people who have to be trained. For estimating replacement needs resulting from retirements and deaths, we need more up-to-date information regarding the age of workers already employed in a particular occupation and more information on their retirement practices. We have been using tables of working life for men and women in the labor force as a whole for such estimations. However, recent Social Security information has shown that individual occupational groups have very different retirement patterns.

But, of course, demand is only part of the story in assessing the manpower outlook information; supply is also critical. In terms of supply, we need to know considerably better how workers in many occupations qualify for their jobs. For a great many occupations there are several ways in which a person can become qualified. Information can be obtained on how workers now in the occupation acquired their skill, and what are the current sources of training for these workers.

As Dr. Evans indicated, little information is available as to what percent enter the field for which they have been trained. One of the major needs in the field of manpower information is for data on occupational mobility of workers. Very little information is available on the number of workers who leave particular occupations each year, and to which occupations they move and why.

The kind of information needed to estimate future supply in the professional occupations can be illustrated by a small job we did for the National Aeronautics and Space Agency. Officials at NASA, who had been under some criticism for taking a large percent of new graduates in the scientific and technical fields, to the detriment of other segments of the economy, were interested in finding out what percentage of new entrants would be needed in their program. So they asked us to estimate the new supply of these technical personnel. To do this we had to estimate how many persons would be receiving bachelor's degrees in a particular scientific or technical field, and what proportion of these could be expected to seek employment in that occupation. For persons with a master's or doctor's degree, the same information was needed, but for these groups one had to determine what percentage of these already were employed in this occupation and therefore were not new entrants, with regard to total number. One had also to consider how many persons with degrees in other fields might be entering the particular occupation, or how many without a college degree but with work experience might be upgraded to these professional jobs, assuming some kind of demand-supply relationship in these occupations. It was also necessary to estimate the number of persons who would re-enter the field—women who had dropped out of the labor force or persons who had moved to another occupation and were returning—and the number coming from other countries.

We have noted that people have used graduates as some measure of future supply. The few studies that have been made, such as "Two Years after the College Degree" and "Five Years after the College Degree," now in preparation by Laura Sharp for the National Science Foundation, indicate great differences among occupations in the proportion who enter the field of training after earning degrees. For example, about 83 percent of the people who receive bachelor's degrees in engineering enter engineering, whereas about one-third of bachelor's degree recipients in chemistry, two-thirds of the master's degree recipients, and 95 percent of the doctorate degree recipients become chemists or teach chemistry, according to this survey. This type of data, of course, will need continuous updating.

Supply and demand are two strategic factors in planning occupational training needs. However, the goal is not merely a match of supply and demand—we must not forget that we are dealing with human beings, not balancing statistics. We need to know more about geographic distribution of occupational employment opportunities, about entry jobs, and about job progressions. Continuing studies of employer hiring requirements should be made. We need to understand more how wage rates affect occupational mobility and job choice. How do various types of incentives affect selection of occupations? And I certainly agree with Dr. Evans that much more evaluation should be done of the various types of occupational training or education programs. I am somewhat intrigued by his concept of "value added by education," but I am not too optimistic about the possibility of developing a good way to measure it.

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Dean Evans has provided us with a thought-provoking paper. He has raised many important questions, though he does not attempt to answer them. Unfortunately, my remarks will raise still more questions.

One question is this: what basis is there for drawing the distinction between "vocational" and "non-vocational" education? While we know little about the financial returns to education, what we do know suggests that the distinction between vocational and non-vocational is not clear-cut. If one looks at the Census data relating educational attainment to earnings, one finds that education seems to pay off.

What education pays off? Is it "vocational" education? This is hard to say, because all kinds of education have been lumped together by the Census Bureau to obtain the number of years of schooling, irrespective of type. Nevertheless it is important to note that most of the people who attain any given educational level have not taken courses of study generally called vocational, and yet they seem to be reaping rather substantial financial payoffs from their education. This suggests that the financial payoff to education "in general" may be substantial—perhaps even higher than the payoff to "vocational" education. If it is as high or higher, then it would seem that non-vocational education has greater vocational value than vocational education! Additional research is needed on the productivity effects of various types of schooling, but at this point we might be justified in questioning the rationale for the conventional distinction between "vocational" and "non-vocational" education.

A second question I wish to pose concerns the precise nature of occupational forecasting, for it is on the basis of such forecasts that educational plans are presumably to be based. Are the forecasts designed to indicate the number of people who ought to be in some given occupation at some given time, or the number who will be? With respect to the former, it might be said that the answer, at the conceptual level, is as follows: the number of people that "ought"—in terms of economic efficiency—to be in each occupation at a time is that number such that the real rate of social return at the margin to investment in all occupations is equated, and is equal to the marginal rate of return on other kinds of investments. This formulation says nothing about whether jobs are, or are not "available," but instead focuses on the prices at which they are available. A very low price will, after all, produce a low rate of return on investment, and, hence, be an indicator of excessive entry to that occupation. I realize that estimating lifetime rates of return is not simple—but such is the task confronting those who wish to forecast "occupational needs." Perhaps an alternative specification of the meaning of such "needs" can be made, but I suggest that hard thinking about the matter is required. To measure without a clear understanding of what we are really trying to measure is unlikely to produce a useful result.

In addition to forecasting what the occupational distribution ought to be, one might wish to forecast what it *will* be. The principal difficulty here is to decide whether one wishes to forecast what it will be *after* taking account of the effect of the forecast on the educational and occupational choices made by present and prospective workers (type I forecast), or *before* taking that effect into account (type II forecast). After all, such a forecast may be designed to influence these choices. Therefore, a type I forecast is really two forecasts in one: a forecast of the occupational structure as it would be if no special effort had been made to influence labor supply; and a forecast of the effectiveness of that effort. Needless to say, such compound forecast is difficult to evaluate. On the other hand, a type II forecast, which disregards the influence of the forecast on labor supply responses (an influence that is desired), is also exceedingly hard to evaluate, for we can only conjecture what the occupational structure would have been had patterns of education and training not been influenced by the forecasts of occupational requirements.

Fundamental to any attempt to assess needs for persons in particular occupations is a clear understanding of—and a useful set of operational definitions of—the actual occupational structure of the economy. Specifically, we need definitions of occupations in terms of skill mixes and skill clusters appropriate to each. This is to suggest that each occupation be defined as some particular combination of skills. While it is very difficult to specify the entire set of skills used by persons in each "occupation," as occupations are presently classified, and while it is difficult to specify the importance (weights) that should be attached to each skill component in order to indicate its relative significance in that occupation, an attempt to do both appears to be worthwhile.

Such an exercise would constitute a search for skills common to various "occupations." If such were found, reconsideration of our present occupational categories would be called for. Even though no single set of occupational categories is ideal for all purposes, one principal use of these data is for forecasting occupational mobility. And for this purpose occupations should be defined in such ways that the *intra*-occupation cross-elasticity of *supply* is high relative to the *inter*-occupation cross-elasticity, just as *industries* are usefully defined, analytically, so as to exhibit relatively high *intra*-industry cross-elasticity of *demand*. We might be able to learn a good deal about commonality of skills among various "occupations" by analyzing actual patterns of inter-occupational job-switching.

I turn now to some basic questions about the meaning of "occupational data requirements" and "educational planning." Why is educational planning desired? *First*, what are the goals of educational planning? It seems clear that planning with respect to labor market opportunities is certainly not the only justification for an educational system, or for its planning. There are undoubtedly multiple goals of the educational system, and if so, it is improper to plan with respect to only one of them. But what are these other goals of educational planning? Can they be stated in operationally meaningful form? What are the "trade-off's" among the goals?

Second, why are occupational data needed for educational planning. That is, why are such data needed for decision-making in the education industry? Casting the question in the latter way helps to suggest answers, for all firms in all industries are concerned about present and future demand for their products, as they seek to adjust both the quantity and nature of their production to changing demand patterns. So, too, with the education industry, one of the outputs of which consists of persons with particular sets of marketable skills and knowledge. Obviously, the demand for the output should influence production levels.

Although in one sense, employers are the "customers" of the education industry, in another sense students and parents are the customers. It is understandable that these buyers of educational services should seek information about the variety —in terms of value in the labor market. Students understandably wish this information in order to choose wisely among alternative education and training programs. Of course, a "wise" choice is not necessarily that which will lead to the largest subsequent earnings from employment, since non-vocational goals will also affect decisions.

Another reason for desiring some forms of occupational data as an input to the educational planning process exists insofar as there are real external economies from particular types of education, or in general, insofar as the social benefits exceed the private rewards from particular forms of occupational training. But how often is society's interest in the education of a person greater than his own interest? Further study of the nature of such cases would be justified.

At this point I would like to conceptualize some of the issues that have been discussed at this Conference by talking about two production relationships. One is a production function for the economy as a whole. In general form it might be written as follows:

$$Q = F(L_n, Lq, K, N), \qquad (1)$$

Where Q is the quantity of real output
F represents the state of technology
L_n is the quanuity of labor inputs
Lq is the quality of labor inputs
K is the capital input, and
N is the input of land and other natural resources

At this Conference, attention is being focused on Lq as a variable that is influenced by educational investment. If the state of technology is regarded as given—that is, determined by forces that are exogenous to the educational system—and if the supplies of labor-quantity, capital, and natural resources are likewise determined exogenously, then output will vary with the quality of labor. That is, with all of those variables held constant, there is some educational *mix* of the labor force (for any given *total* level of education embodied in the labor force) that will maximize output. However, this statement, while correct, can be misleading. It says that a particular educational-occupational mix is *ceteris paribus*, "required" to maximize output. It does *not* say, though, that changing the educational mix of the labor force is more important as a contributor to output than is an increase in the supply of some other input or a change in the state of technology. Moreover, these other variables are not really fixed, nor are their values independent of the educational attainments and skills of the labor force.

A full specification of the form of the economy's production function would also indicate the extent to which one resource input can be substituted for another in production. These substitution possibilities are frequently overlooked by persons examining the occupational "needs" of the economy. The experience of the economy during World War II is instructive in this regard, for it demonstrates how input bottlenecks can be by-passed by changing production techniques and substituting among inputs. The point is that to talk about *needs* for labor with particular training and skills is dangerous insofar as "needs" are interpreted as being essential. And, in fact, little is known, in general, about the ease or difficulty of substituting other inputs for educated and trained workers, when the latter are unavailable or "costly." However, the presumption is that substitutional possibilities are not of negligible significance. Hence, the severity of consequences of the economy's failure to meet educated-manpower "requirements" remains essentially unknown. And this is a critical matter. Obviously, whether society should be much concerned about meeting occupational requirements hinges on the results of not meeting them. We have much to learn.

Having looked briefly at the economy's aggregate production function—in which the education embodied in the labor force enters as an input—we might now look at another production function—in which education is an output:

$$E = g(S, T, K_e), \tag{2}$$

Where E is the output of the education system
g represents the state of technology in education
S is the input of students
T is the input of teachers
K_e is the input of capital equipment (buildings, equipment, lighting, etc.)

Equation (2) says that the education-industry output depends on the abilities of students, the labor and capital inputs, and the available knowledge regarding ways by which educational inputs can be combined.

How is *E*, the output of the education industry, related to L_E in equation (1), the education that has productive value in the labor market? In other words, what is the labor-market value of what the education system is doing? This depends on a number of variables in the economy as a whole: especially on the nature of consumer demand patterns, the stocks of cooperating resources in the economy, and the state of technology—all of which influence the marginal value productivity of any given amount and type of education. But if the labor-market value of education is determined by a variety of inter-related variables in the economy, so, too, in reciprocal fashion, these variables are influenced by educational attainments of the population. The forms and amounts of investment in physical capital that are profitable to produce depend in part upon the skills and educational attainments of the labor force. To see this is to recognize that particular educational attainments of labor force members are not *required* by the demands of consumers and the stocks of other resources, any more than particular investments in physical capital are *required* by the existing stock of *educational* capital in the labor force.

Equilibrium in each input market as well as in output markets are determined jointly. Thus, it is unwise to treat educational occupational planning as a process of "discovering" what the economy's educational "requirements" will be, thereby implying that education decisions themselves have no significant effects on other markets.

Even if it were true that certain education-occupation requirements do exist, the question would remain as to the amount of educational planning that is needed to meet these needs. One issue deserving additional research attention is the responsiveness of the supply of workers of a particular type to changes in market conditions. To illustrate: it has been observed that there seems to be a shortage of college teachers of certain sorts. For many purposes, however, college teaching is not really an occupation, because if we look at the skills required we find that there are a number of people working in industry, or in government who have precisely the skills that are required for college teaching. In fact, many people have moved into education from these other occupations in response to changes in earnings opportunities. Supply elasticities are seldom equal to zero, even in the short run. We again conclude, though, that the precise importance of occupational data for educational planning depends in large part on short and long-run supply elasticities of labor, and the influence of occupational forecasts on these elasticities. At present, little is known about the issues. Implicit in the argument in favor of explicit occupational forecasts are the assumptions that the forecasts we are able to make are, in general, better than having no explicit forecasts, and that the cost of developing the forecasts is exceeded by their value.

In conclusion, I would like to highlight a few points. First, it is very important to recognize the multiplicity of goals in education, and, when referring to the occupational goals to not lose sight of the other goals, which may in fact conflict with what is rational in terms of the occupation goals alone.

Second, it is important to emphasize the complexity of the functional relationships among inputs and outputs in the economy, and the opportunities for substituting one kind of input for another. Third, it should be noted that education is both an input to the production process, and an output from it. Thus, while it is true that decisions made in the rest of the economy hold implications for the education industry, so also do decisions made within the education sector affect the rest of the economy.

PART II

THE ROLE OF TECHNOLOGICAL FORECASTING IN THE DEVELOPMENT AND USE OF MANPOWER

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THE ROLE OF TECHNOLOGICAL FORECASTING IN THE DEVELOPMENT AND USE OF MANPOWER

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In February 1965, the President's Manpower Committee and the Commission on Automation established a task group to study the actual and potential use of technological forecasting in the federal government, with special attention to its application in the development and use of manpower. The Departments of Labor, Health, Education, and Welfare, and Commerce contributed participants to the task group, which has five members; I have served as its chairman.

The task group began with an analysis of "action points" —that is, points in the process of developing and using manpower in which technological forecasting is or might be used —with the aim of discovering: the availability of technological forecasting information; the actual use made of this information and the reasons for use or lack of use; the adequacy or inadequacy of this information; the requirements for useful technological forecasting information, particularly with respect to span of time, geographical scope, occupational specificity, and the like; and the kinds of technological forecasting which have been undertaken, the methodologies explored, and their adequacy to the requirements for such information in the development and use of manpower.

In order to answer these questions, about 40 interviews have been conducted with those in federal agencies concerned either internally or externally with technological forecasting and with Departments of Labor and Education in several state governments. Sixty interviews have been conducted in six municipal areas (Atlanta, Boston, Chicago, Denver, Los Angeles, and Washington) covering high schools, vocational high schools, junior colleges, public and private employment agencies, companies, and labor unions. Interviews have also been conducted with companies, unions, associations, or other groups specifically concerned with programs to ease the blow of unemployment or to encourage re-employment. Finally, approximately 30 interviews have been conducted with men engaged in technological forecasting or in exploring forecasting methodology. These interviews do not represent a statistically adequate sample. Conclusions drawn from them are indicative, rather than definitive.

The nature, methods, and problems of technological forecasting vary widely with the ways in which forecasts are to be used. Forecasting should be studied according to its uses. The principal uses to which technological forecasting is being, or may be, put all have to do with planning (see Figure 1).

Figure 1.

Investment policy planning	R & D planning	Resource allocation	Manpower	Other policy planning
Where shall we (as a nation, or as a corporation) put our dollars ?	How shall we invest in research and development ? What should our priorities be ?	What will our scarce resources be ? How should they be optimized ?	(See below)	E.g., tarif tariff, loan, subsidy, regulatory

When we speak of the development and use of manpower, we mean the activities we undertake as a nation that affect the matching of trained available manpower with occupational requirements. Measures of their effectiveness are the rate of unemployment and the availability of skilled men to do the jobs which need to be done. These activities are of three major kinds.

(1) *The development of skilled manpower* includes programs of education and training, as well as legislative and

regulatory policies and practices which affect the supply of people available to do work (e.g., immigration policy, child labor laws).

(2) *Job-creation.* These include the activities of the nation that have the effect of creating requirements for people to do work. From the point of view of the federal government, they include: (a) policy, such as monetary and tax policy, that affects the over-all level of the economy; (b) specific missions which need skilled manpower—e.g., Defense, National Aeronautics and Space Administration; (c) programs of job-creation designed to relieve unemployment, e.g., ARA, Appalachia; and (d) other policies which affect occupational requirements in the U.S., e.g., import/export.

(3) *Manpower adjustment* activities mediate between manpower supply and demand by (a) providing information about manpower supply and demand (guidance, employment service); (b) retraining for employment, and (c) softening the blow of unemployment and promoting labor mobility.

We will not cover here the use of technological forecasting in policy and program planning not directly related to the development and use of manpower or in planning the job-creating activities of government. We have so far concentrated on education and training, providing information about manpower supply and demand, "softening the blow" of unemployment, and promoting manpower mobility. These activities are to be found in federal, state and local governments; universities, junior colleges, and secondary and special vocational school systems; industrial corporations, and unions.

The federal government has internal and external activities relating to manpower adjustment. Internally, agencies are concerned with projecting their own future need for skilled manpower and, to a lesser extent, estimating the manpower dislocations to be produced by their own programs. Externally, some agencies—principally HEW and Labor—support educational and training programs which make them interested in anticipating requirements for skilled manpower and support guidance and other "mediating" programs which make them interested in projecting occupational requirements.

There are chains of financial support, law, policy, and information which connect these mediating federal programs with state mediating programs (principally, guidance, employment service, and training), university programs (training counselors and trainers), and schools (universities, junior colleges, special vocational schools, high schools, vocational high schools). In addition, there are important mediating programs undertaken by industrial companies, unions, private employment agencies, bankers, civic groups, and the like.

The following are broadly applicable findings covering our subject matter: the cutting edge of the educating, training, and mediating activities—the place where the actual manpower development and adjusting activity is done—is primarily at the local level, counties, municipal areas, and towns. National, federal, and state programs serve primarily to provide resources (dollars, people, information) for local programs or to set guidelines for them. With respect to guidance and training, there are informal activities—families and peer groups, for example—which are to the end result as important as or more important than the formal programs of schools and employment services.

There is no interest in technological forecasting *per se*, but only in forecasting availability of skilled manpower and/or occupational requirements for skilled manpower. Technological forecasting is interesting as a route to one or the other. Since technology is only one of many factors influencing available manpower or occupational requirements, the most useful forecasting would be "total forecasting" of manpower availability and occupational requirements, of which technological forecasting would be a part.

The use of technological forecasting in manpower development and adjustment needs to be considered from two viewpoints: as a service to mediating activities essentially as they are and as a service to such activities as they might be some time in the future. Because the latter requires rationalizing the total manpower development and adjustment system, we are not considering it here. Our consideration of technological forecasting relates to manpower development and adjustment activities essentially as they are—improved, perhaps, but not radically different from their present form. Later analyses of the nation's system for using and developing manpower may permit a longer-range treatment of the possible role of technological forecasting in that system.

HELPING PEOPLE TO FIND JOBS

The interest in occupational requirements of local counselors, vocational training, and employment services is extremely short-range. It ranges from 0 to 10 years into the future, with the great majority of requirements ranging from 0 to 5 years.

Forecasting needs of middlemen for
unemployed: = 0
drop-outs: = 0
vocational students: = 0 - 2
junior college graduate: = 0 - 6
high school graduate: = 0 - 10
employed: = 5 - 10

The geographical range of the interest of these middlemen is narrow. The primary emphasis is *local*, i.e., on metropolitan areas. There is *interest* among state departments of education and labor in generating and using state-wide and regional information about occupational requirements. There is some interest in the use of this kind of information at the local level, but it is not clear how this information could be effectively translated into action by those at the local level who have the responsibility for helping people to find jobs. At the university level and beyond, the geographical range of information required is broader, extending to the regional and national range.

Information about occupational requirements available to local agents includes the following: (1) reports from employers of immediate job opportunities; (2) local, short-range projections by banks, civic groups, business men, utility companies, and others, about the number and kinds of occupational requirements which will hold for the area; (3) in some states, state-wide, short-range projections of occupational requirements; and (4) national projection of occupational requirements and manpower availability by skill level—primarily from Census, Labor, and HEW. At the local level, this information is used sporadically and inadequately.

The reasons for this inadequate use of existing information are as follows. First, national information is difficult to understand in terms of local industries. Second, where there is an emphasis on vocational guidance, vocational schools, and employment services, requirements for *immediate* placement take priority. Third, in high schools and junior colleges where there is not this emphasis, guidance toward occupation tends to take a back seat. The ratio of students to counselor is high (300:1 to 600:1), and other guidance functions—e.g., attention to student aptitude and interest and to personality problems—tend to take priority. Fourth, there is difficulty in *interpreting* occupational forecasting information to the student; it is not clear how to do this. Fifth, student attitudes and interests—shaped by family and peer attitudes, relating as much as anything to occupational status—tend to be more important than information about occupations in determining the directions in which jobs will be sought.

But a great deal of the information about occupational requirements (short-range and local) is potentially available to meet local demand. For more effective use, it would need to be: synthesized, made centrally available, regularly up-dated, well advertised, and coupled with help in *interpretation* to those seeking employment.

PLANNING AND PROVIDING RESOURCES FOR THE PROCESS OF EDUCATION AND TRAINING

Federal agencies, such as HEW and the National Science Foundation, concerned with supporting aspects of the educational process—facilities, training teachers, curriculum development—are interested in forecasting occupational requirements and skilled manpower availability in the relatively long-term future, e.g., 10 to 20 years. They want national information organized by broad skill or discipline, e.g., "physical scientists."

Many agencies, such as NASA, the Federal Aviation Agency, and the Atomic Energy Commission, want to forecast the availability 5 to 10 years hence of skilled manpower required for their own missions. These agencies tend to be concerned primarily with the availability of *manpower* data, and again, with broad disciplines and skills. To a lesser extent, individual industrial corporations have the same kind of concern. On this level, as interest in forecasting goes beyond 5 to 10 years, the occupational categories of interest broaden proportionately.

There is interest in state departments of education in forecasting occupational requirements in order to help plan curriculum change for the vocational part of the state's educational program. This interest tends to range from 5 to 10 years (5 years was presented as a *minimum*, because of a 5-year lead time needed to effect state-wide curriculum change).

Nevertheless, there is widespread recognition of factors which tend to inhibit the *use* of such information. There is perceived a need to design curriculum of at least vocational schools for immediate placement of graduates (which could mean that a curriculum change that takes five years to bring into being ought not to answer to an occupational requirement more than 5 to 7 years in the future!). Curriculum tends *not* to change, or to change only peripherally, at the edges. There is the widespread belief that curriculum design is more influenced by student attitude and interest—often based on family and peer influence—than on data about occupational requirements.

ACTING TO SOFTEN THE BLOW OF UNEMPLOYMENT

There are fewer such programs that might be supposed. Many announced efforts by companies, unions, or agencies to anticipate and ease dislocations produced by new technology or by other factors, tend to evaporate on close inspection.

By and large, the existing efforts in this field consist of responses by organizations to anticipated dislocations caused by changes which they can predict *because they are in their control*, e.g., FAA's installation of new traffic control systems for which they can prepare by letting attrition take effect, by retraining, or by helping workers seek new employment.

These responses are ad hoc and do not require more generalized forecasting.

There is interest, particularly among labor unions, in anticipating occupational dislocations 5 to 10 years hence. It is not now clear how closely related to action this interest is.

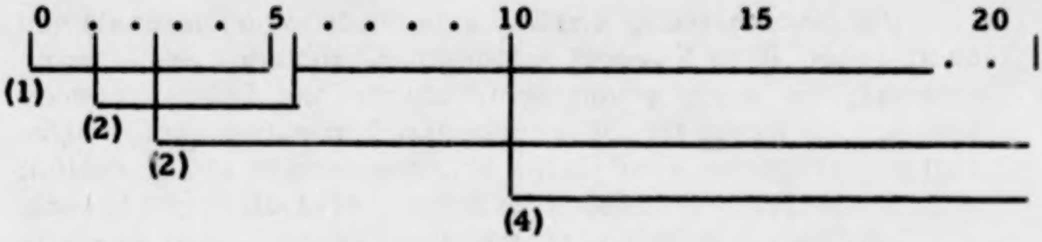
The overwhelming emphasis is on local (municipal) and short-range (0 to 5 years) information, though there is some interest, at state government, union, and federal agency levels, in forecasts of occupational requirements and/or skilled manpower availability which extend to state, region, or nation and to 10 years as a limit for almost all requirements.

Information relevant to the short-range, local needs is potentially available, but not assembled or interpreted, and tends not to be used because of lack of synthesis and central availability; inability to interpret such information to clients or students; and conflicting influences either on student decision or on professional actions.

Technological forecasting—or technological forecasting as an aspect of total forecasting of occupational requirements —may concern itself with forecasting the occupational and manpower impacts of invention or discovery, innovation (the commercialization of invention), and diffusion (the spread of innovation). Figure 2 following shows the time range of forecasting requirements related to type of forecast. What it says, in effect, is that technological change, as opposed to other factors, does not begin to be significant as a determinant of occupational requirements until after about three years. The diffusion of existing technology begins to be important at three years—depending on ease of introduction of the technology—and may continue in importance for twenty or more. Innovation—the commercialization of an existing development not yet introduced into commerce—will not begin to be important until after ten years.

To meet the needs of those included in the development and adjustment of manpower, (1), (2), and (3) are relevant, in that order of priority. (1) and (2) are already potentially available to meet local requirements. (3) is in principle the most feasible form of technological forecasting and the one to which least effort has been directed.

Figure 2.



(1) Information about employment opportunities from employers

(2) Local job-trend information

(3) Diffusion of technology

(4) Innovation

PRELIMINARY RECOMMENDATIONS

It would be useful to establish local municipal centers of information covering present employment openings and job trends in the municipal area. Information of this type tends to be available from employers, civic groups, banks, utilities, and the like. It needs to be assembled, digested, regularly updated, and made available to local guidance, vocational, and employment service people, as well as directly to those needing employment. Most of all, help needs to be provided in interpreting such information to those seeking employment. Such local information centers could be usefully coupled with the institution of local business and industrial advisory councils.

As a second step, such local information centers could usefully expand to establish regional information centers, concerned with regional occupational and manpower trends in the 0 to 10 year range. Such regional centers would be concerned, as well, with analysis of the rates and direction of regional diffusion of technology over the 3 to 10 year range. For this purpose, national trend figures covering skilled manpower and occupational requirement—based in the past on estimates of the diffusion of technology—would be useful.

It is plausible that long-range—10 to 20 year—and national forecasts of occupational requirements might eventually be useful in manpower development and adjustment. But our investigation indicates that, given these activities essentially as they are, this plausible assumption is false.

In order for such long-term, national information to become useful, a great deal about manpower adjustment activities would have to change—including the factors that now prevent adequate use of available information. Among other things, measures of effectiveness of manpower development and adjustment activity would have to be developed in order to determine the effectiveness of forecasting information. The possible role of such long-term, national information can best be considered as part of a broad approach to manpower development and adjustment activities as a national system.

DISCUSSION

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"If the theory doesn't agree with the facts, so much the worse for the facts." There are undoubtedly some who will read Schon's paper and conclude that there is something wrong with the facts. For the facts do call into question many preconceptions and preconceptions are hard to give up.

I do not hold this view and shall *not* quarrel with the facts the paper presents. Perhaps this is because the facts that are presented fit *my* preconceptions. I make no claim—at least not in print—to possess a greater willingness than the next man to give up old beliefs. I simply prefer to believe

Mr. Schon's facts. I, therefore, leave to others all the questions that could be raised about the representativeness of the interviews, the quality of responses, and so forth. I agree with Schon that the interviews that were conducted are indicative, that the responses were meaningful.

What is Schon telling us? Something quite significant: national occupational data are not really utilized at the local level, occupational forecasts are not interpreted to the student, and things don't move very smoothly. This is not surprising, given the fact that in the United States things that happen and decisions that are made in the fields the paper is concerned with (e.g., training, counseling) occur at the local level; given the fact that informal guidance may be even more important than formal counseling programs; given the fact that the time and geographic horizon of the decision-makers is narrow; and given the other facts that Schon speaks of. The question, therefore, is what would we change if we desire improvement?

It is the current fashion—in some circles—to argue that what should be changed is the scope, quality, quantity, and detail of the occupational forecasts and projections. More forecasts, better forecasts, more detail, longer time horizons—all this is the solution. Schon's paper forces us to ask whether this is really so. Would bigger and better forecasts change the facts cited in the previous paragraph?

Decisions will still be made at the local level—and shouldn't they be, the time horizon will still be short—and shouldn't it be, peer groups will still have influence—and shouldn't they, and so forth. It is not clear that these conditions are grounds for pessimism, nor are they things to be sad about. They represent the situation not only as it is (and is likely to be), but as many of us would have it be. Some of the consequences of the facts may be deplored—but would we change the facts (even if we could)? Should decisions shift from local hands, should the time horizon be long when the job is sought next year, should parents and peer groups be ignored (are counselors the repository of all wisdom—can they be, should they be)? Many would answer "no."

Changes, therefore, will be made by small adjustments that attempt to modify the results of the process at work—rather than by wholesale alterations in underlying patterns of behavior. This is as it should be. It is not surprising, therefore, that the proposals offered by Schon appear modest: a little more information, a little more dissemination, a little more interpretation. The burden of much of what he says is that we now know more than we are using and that we ought to learn to make better use of what we have before embarking on more (long-range) projections. What we have (with improvement in equality and currency) *can* be useful.

I would agree with Schon's rejection of a trickle-down theory. That theory says that since relevant information is not reaching the right people in sufficient quantity, we should remedy the problem by pouring in more information at the top. Trickle-down theories will not work in this arena—as in many others as well.

This does not mean that we do nothing. Better local data would be useful; more support for a regional and national perspective would help; the 300-600 to 1 student to counselor ratio can be reduced. These are the adjustment points, rather than detailed long-range projections, to serve a population that needs jobs in the immediate future.

Such changes at the margin are not without value. But they are also not without cost. An important question thus remains—are these changes, these new programs, likely to justify themselves as compared with other programs in these (or other) areas? This question needs investigation—and here, too, the time horizon should be short. We need not wait a decade for the answer. Schon's contribution is that he tells us about the world as it is and not about some imaginary state of affairs. This is an important contribution, for the answer to the question should be sought in the context of the world that exists—but sometimes goes unrecognized.

W. LEE HANSEN
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Mr. Schon's paper represents a preliminary and partial report of a Technological Forecasting Group, established as an outgrowth of The President's Committee on Manpower and the Automation Commission. Inevitably, reports of this kind tend to be very general in scope, broad in their coverage of topics, and usually cryptic in dealing with some of the most interesting issues. But compounding the difficulties for a discussant of this paper is the rather peculiar use of the term "technological forecasting." If "technological forecasting" refers to the "forecasting of technological change"—the rate at which new knowledge is being discovered, applied, and diffused through the economy in resource-savings forms—then the paper has relatively little to say on this topic. Or if the paper is attempting to discuss the impact of such changes on the quantity and quality of manpower "requirements" in either or both the short run and/or long run, then again there is little of a concrete nature to be found. Yet the bulk of the paper does seem to talk about manpower "requirement" projections as if they are largely synonymous with "technological forecasts." In principle, the effects of changing technology on manpower requirements can be separated from the effects of, say, population-induced increases in requirements. But in practice, the technological change component is implicitly embedded in projections of manpower requirements, particularly those by occupation and industry.

All of this raises a number of interesting questions. For example, to what extent are forecasts of technological change available, and in what kind of detail? How are such forecasts made? What degree of accuracy can be anticipated in such forecasts? Do they err most in the magnitude of the changes or the timing of the changes? While these questions are of great interest and concern, we must also ask: how are technological forecasts translated, or how can they be translated, into manpower requirements? How successful have such efforts been? What is the nature of the temporal linkages between technological changes and shifting manpower requirements? And so on. Hopefully, some of the difficult questions such as these will be considered in the final report of Mr. Schon's group.

The most interesting part of the paper concerns user demand for projections of changing manpower requirements, as determined from field interviews with representatives from schools, employers, unions, employment agencies, and the like. In short, there is little information available on either long-run or short-run changes, and what does exist either is, or is thought to be, largely irrelevant to job counseling and career-choice activities. Consequently, most effort goes into current labor market activities, such as placement, on-the-job training, and the like. The reasons seem obvious enough, but it is to be hoped that the results of the many interviews conducted by the Task Group can be effectively summarized to reveal the full range of reasons given.

The fact that technological forecasts and projections of manpower requirements, even when available, appear to be of little practical use does not necessarily mean that all work in this area should be abandoned. Instead, it suggests that we must first attempt to learn more about the process of technological change and its impact on manpower requirements and labor market conditions; at the moment we seem to know very little. The results of this work must then be made available in meaningful terms to those who shape education and training programs, as well as to those making career choices. This is a formidable task, lacking as we do any real theory of projections. Even then, however, there is no guarantee that the information can or will be used in such a way as to accomplish the objectives implicit in the nation's rapidly developing manpower policy.

STANLEY H. RUTTENBERG
DEPARTMENT OF LABOR

Mr. Schon's paper supplies us with a framework for thinking about problems of technological forecasting. He has tendered it as a preliminary report, and we must view it as such. I am confident that he and the Task Group on Technological Forecasting later will elaborate the many deserving points in his sketch.

My few comments are mainly concerned with matters of emphasis. In Mr. Schon's presentation, for example, it appears that the value and purpose of technological forecasting are seen mainly from the point of view of serving the new manpower needs of changing and newly emerging industries. I would argue that there is a parallel value and purpose to such forecasts, that of servicing the re-training and re-employment needs of those workers caught in the tumult of technological change. Responsible manpower policies must give both these perspectives their due. The long-run benefits of technological change do not solve the short-run distress of the displaced. It is the latter that gives the exploration of technological forecasting a special urgency.

In recognition of its potential significance for manpower decisions, the Department of Labor has established a demonstration project on manpower forecasting. This project tests the feasibility of using interpretive analysis projections in selected industries to provide an early warning of the impacts of technology with special emphasis on the manpower implications. The program has three phases: (1) Identification of New Technology and Possible Impacts; (2) Analysis and Interrelation of Technological Impacts; and (3) Detailed Analysis of Specific Industries, Sectors, or Processes.

Specific manpower problems likely to occur are highlighted in order to provide administrative information for Labor Department programs and policy development, and draft recommendations will be outlined for advance action which could be taken by the Department to minimize labor force dislocation before it occurs. Major emphasis throughout the study will be placed on the study team's interpretation of the information collected and on its resulting best estimate of the future manpower impacts of technology.

The features of our demonstration project affirm what Mr. Schon makes clear in his report—that technological forecasting now lacks a solid base of empirical data. We hope Mr. Schon's and our efforts will prove useful as a beginning. We realize that we have a long way to go in making such forecasts a sure tool of manpower policy making.

One final comment: Mr. Schon makes several important observations on why even the existing information about the shifts in our occupational structure is inadequately used. These observations underscore the most problematic feature of technological change, that is, adjustments to change are affected by existing social institutions, such as the school and the family, to use Schon's illustrations.

Thus, our task goes well beyond getting a technological forecast and understanding its implications for change. Ultimately we must find ways of effectively transmitting such knowledge to those institutional bases which are capable of applying the knowledge in an adaptive way. And because of the necessity of fitting our manpower decisions into a preexistent institutional setting, we cannot afford to ignore the problems introduced not only by the fact of change, but also by the rapidity of change. By definition, our social and economic institutions adapt to change at a lumbering pace. Once in a while we need to make them sprint. That is the challenge presented to us by our advancing technology.

M. H. TRYTTEN
NATIONAL ACADEMY OF SCIENCES, NATIONAL RESEARCH COUNCIL

I found Mr. Schon's paper useful and well thought out. My comments are not to be taken as negatively critical, but rather as pointing to vistas he might wish to explore further.

I would, however, caution against conclusions such as that near the end of the paper, on the time between the advent of new technical knowledge and its commercial exploitation. The time is exceedingly variable. In chemistry the time may be very short indeed, especially perhaps in pharmaceuticals, but even here the times involved are a spectrum from long to short. The time from the birth of an idea to commercial flotation depends on the vision and economic strength of its sponsor, the need for it, the common understanding of the need, and the trickiness of preparing for market.

I would like to comment on job creation. I may have missed a point, but I sensed that Mr. Schon thought of job creation as an organized social function to be carried out by various levels of government, although his point may be that his purpose was to concentrate on the sale of government.

My comment is that the development of entrepreneurship may be the most important need in job creation. Whether this trait is where you find it or can be developed may be a moot question, the answer being possibly "both." But like other phenomena, the occurrence is not independent of the environment.

The relevance here is that the demand in many fields is directly dependent on entrepreneurship, its magnitude and vigor.

The outburst of new research and development businesses and corporations between 1945 and 1950 is a good example of this. Hundreds of persons forcibly jarred from academic and basic science prior to World War II into applied science during the war stayed in that new world, but organized their own concerns, literally hundreds of them, some growing to great size (Litton, Texas Instruments, etc.). This was job creation for many.

I would also comment that for certain functions job demand may be of little meaning or virtue. To illustrate my point, suppose half the best creative research scientists in our country were to be erased as though they never had been. Obviously, much now coming to light or coming to light in the past would simply not exist. But who would know the difference ? One cannot visualize or measure what never was.

The point here is that at this level the value judgment of society and its institutions must be reflected in what exists as employment opportunities, not some optimum determined by the market place. If we ever learn to put a measuring stick of social value to new knowledge, perhaps we can be wiser than we now are on this point.

PART III

FOREIGN EXPERIENCE IN THE UTILIZATION OF OCCUPATIONAL DATA FOR EDUCATION PLANNING

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EDUCATIONAL PLANNING IN WESTERN EUROPEAN COUNTRIES

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A description of educational planning in Western Europe is complicated by the fact that fifteen of the eighteen countries are now involved in some type of planning activity. Further, there is a considerable diversity in the scale and scope of their efforts and in the way in which they relate education to the condition of economic growth or development. France and the six less developed countries bordering the Mediterranean have extensive planning functions, closely related to national development goals. Five others (Ireland, the Netherlands, Belgium, Austria, and Norway) have established educational planning units, but their experience is limited and less directly oriented toward development than that of the Mediterranean group. Finally, Sweden's extensive experience in educational planning is not specifically directed toward growth or manpower problems, nor are the more limited activities of the United Kingdom and Denmark.

The degree of commonality that does exist results from the fact that much of this activity is a function of the Organization for Economic Cooperation and Development (OECD), and of its primary concern of the economic development and growth of its member countries. Interest in educational planning and human resource development originated within the OECD in the Directorate for Scientific Affairs and is based in its concern in the role of science and scientific and technical personnel in these economic processes.

The influence of the OECD on national activity in educational planning has been of particular importance, as it has induced a widespread acceptance of the concept of investment in education, and as it reflects a primary concern with high-level manpower requirements and with formal education as the principal instrument for manpower development. Further, the

OECD is a policy-oriented organization, and the activities which it has generated assume forms that are directly relevant to policy formation.

Member government activity in this aspect of planning is related to two functions of the Directorate for Scientific Affairs: the Mediterranean Regional Project (MRP) and the Educational Investment Programme (EIP).[1] Both involve national programs of empirical educational planning based in growth or development requirements. The differences between these programs stem principally from differences in the way in which the national programs are related to the OECD activity.

The Mediterranean Regional Project was conceived as a regional case study involving the less developed member countries and is supported equally by the participating countries and OECD. In addition to national planning needs, the project was intended to provide a multi-country test of the feasibility of empirical planning for human resource development in a developing country context and an extensive empirical basis for describing basic planning relationships.

Institutionally, the Mediterranean Regional Project consists of a policy-making group and six national planning units supported by technical consultants from the secretariat. The policy group, comprised of directors of the national planning teams and the OECD secretariat, is concerned with the project design and with national cooperation in its implementation. The planning units are a part of a central planning body or other ministry, or, in two cases (Portugal and Italy), private institutions working through sub-contracts with a ministry of education. There is, in each case, a clear relationship between the planning group and the policy-making bodies of the countries concerned.

The project framework and methodological structure determined by the director's group are formalized in contracts between the OECD and the member government. Consequently, there is a significant degree of homogeneity in the planning

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1. Indirectly, OECD influence has also stemmed from a third activity–the Study Group on Investment in Education. This activity has supported a series of professional seminars or conferences in regard to investment in education, and with the intent of stimulating academic interest and research in the theoretical aspects of human resource development.

experience of the six countries, although the work of the planning units has been carried out independently. On the other hand, they have faced varied conditions in regard to data availability, systems of data classification, the extent of general economic planning, and the complexity and flexibility of the educational system. These differences have produced some methodological variations that limit generalization.

The Educational Investment Programme is less explicit in its objectives and more diverse in the activities encompassed in this framework. Its principal functions have been to induce interest in education planning in the more advanced member countries and to provide a forum for discussion of methodological issues and priorities within the group.

It has not attempted to create a general methodological framework appropriate to all participating countries, or to assure comparability of effort or data within these countries. In a large part this reflects the greater differences in the economic position of the countries involved, in the strength of their commitment to planning activities, and in their capacities for relating education to development objectives in the absence of central planning functions. On the other hand, much of the present interest among the advanced countries has been generated by the MRP, and much of its experience has been transferred through a common secretariat. This influence is gradually producing a greater homogeneity in the EIP framework.

The range of difference in the planning activities of Western European countries is more readily generalized by distinguishing two aspects of educational planning. One defines the instrumental purposes which education is intended to serve, expressed in terms of educational outputs or stocks. The other identifies the internal criteria for evaluating an educational system as a system of production, including the choice of production functions and system relationships which optimize the use of educational resources in meeting given output requirements.

As a generalization, developing countries have placed great emphasis on the *instrumental* aspects of planning, while the more advanced countries have been concerned mainly and, in some cases, almost exclusively with *systems* planning. These national differences in the emphasis or scope of planning activity are often interpreted as differences in methodology or "approach." In reality, there is little difference among European nations in the techniques employed in systems planning. All countries are concerned with expanding educational output and with the constraints imposed by limited educational resources. They have tended to use similar criteria for evaluating educational production functions and intrasystem relationships and similar techniques for applying these criteria in the development of long term investment policies.

The greater variance is in the extent to which they attempt to relate their educational systems to instrumental purposes and in the nature of these purposes. For example, Sweden, the United Kingdom, and Denmark are projecting educational output in terms that are largely quantitative and based in demographic change and changes in educational participation rates, i.e., the demand for education. They are largely preoccupied with the capacity of the nation to invest in education and with the input/output relationships within the system. The objectives and form of education are left to market determination. Although educational investment is partially rationalized in terms of an aggregate relationship between the stock of education and economic growth, there is little concern with making this relationship explicit. This pattern of planning is sometimes described as a "cultural" approach.

At the other extreme, the primary object of planning in the Mediterranean Regional Project is to adapt both the level and structure of educational output to economic development requirements. These requirements define the priority uses of the educational system and are expressed as explicitly as possible in educational equivalents. Since they are most readily quantified in occupational terms, educational objectives are defined in terms of a future occupational structure and derived from economic development targets. Although economic or vocational criteria are supplemented by broader social criteria, the MRP is usually described as a "manpower" approach to educational planning.

Obviously, these two approaches are not different methodologies. They denote differences in the level of detail to which planning is carried and in the weight given to problems of planning in the educational system *per se*, as opposed to those of directing it toward prescribed purposes. Even those differences may be overstated in this attempt to generalize on the experience of fifteen countries. In fact, all except Denmark do use occupational data in some way, and the importance of manpower criteria is increasing with extended planning experience and tight labor markets in the more advanced countries.

The most comprehensive planning experience, as well as the greatest use of manpower data, is in the Mediterranean Regional Project. Further, as noted earlier, it has influenced the present pattern of planning in most other European countries. For these reasons, this discussion of methodology and technique is based largely in that experience.

THE PLANNING FRAMEWORK

The broad methodological framework within which the national teams have functioned is described in the OECD document, "Planning Education for Economic and Social Development."[2] It involves an empirical projection of the educational requirements implicit in prescribed development objectives and the rates of change in the educational inputs and outputs necessary to meet these requirements. More explicitly, it includes:

(a) the projection of a desired state of educational attainment of the population at some future date (educational attainment is defined by level and type of education, and the target date is sufficiently remote to permit the implementation of necessary change);

(b) projections of the educational characteristics of the present population discounted to the target date, and the planning period output of the educational system at its present capacity;

(c) the determination of the rates of change in the level and structure of the output of the educational system required to equate (a) with (b) in the target year. These will be exponential rates, in order to assure convergence with a desired or appropriate educational growth rate after the planning period;

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[2] *Planning Education for Economic and Social Development*, Herbert S. Parnes, ed., (Paris: OECD, 1962).

(d) the determination from (c) of the change in the inputs, structure, and flow relationships of the educational system required to meet the objectives prescribed in (a);

(e) the projection of the unit costs of input changes, and the determination of annual or period investment requirements by level and type of education and type of investment or expenditure; and

(f) a determination of the policy changes required to assure appropriate levels of investment, and the institutional changes implied in the intrasystem flows and efficiency coefficients assumed in (d).

Empirical analysis of this type is relevant to any set of social objectives that can be achieved by quantitative and/or qualitative changes in the educational system. As a general case, the principal criterion for defining the future stock of education in the MRP is the occupational structure required by a future level and structure of economic output and the rate of economic growth. Other social objectives are treated as supplementary or as implicit in this criterion.

The priority given to occupational requirements is rationalized by the fact that skill deficiencies appear to be the primary bottleneck to growth. In low-productivity economies such as these, the attainment of other social objectives which require educational resources will depend on the prior extension of the resource base, and manpower objectives are accorded only time priorities. In practice, narrow occupational distinctions are made principally in higher education, where educational faculties are normally described in occupational terms. They are made in a more general form, as technical versus general education, at the secondary level, and no distinction is made in primary education. At each level manpower and non-vocational objectives are merged in curricula and course content. Further, education has been defined broadly to include informal programs to improve the quality of the existing manpower stock, as well as formal education.

The importance of manpower requirements as criteria for educational planning, and the procedure for their employment in the Mediterranean countries, can be illustrated here only briefly and in aggregate form. More detailed descriptions are contained in the reports of the National Planning Teams and a forthcoming technical evaluation.

GROWTH TARGETS AND MANPOWER REQUIREMENTS

Each of the Mediterranean countries is committed to attaining an annual rate of growth in GNP of 5 percent or more. These target growth rates range from 5 percent in Italy and Portugal to 9 percent in Yugoslavia and will require radical change in economic organization and social institutions.

In 1961, gross national product per capita in five of the Mediterranean countries ranged from 192 dollars (Turkey) to 383 dollars (Greece). All are predominantly agricultural in terms of employment, and agricultural productivity tends to be low. Each country has a significant industrial component, but these sectors are characterized by very small establishments and labor-intensive techniques of production. Per capita consumption, levels of educational attainment, and other measures of economic well-being reflect a level of development well below the average for other OECD member countries. The per capita GNP of Turkey is, for example, only one-seventh that of France. Of its population over 5 years of age, 58 percent is illiterate, and 72 percent have no formal education. It reflects, with all other Mediterranean countries, the development paradox of chronic and disguised unemployment in conjunction with very tight labor markets for skilled manpower.

The sixth participant in the MRP—Italy—is, in some dimensions, a special case. It enjoys a much higher level of economic activity in the aggregate, and its industrial sector is proportionately greater and more advanced technologically. In global terms it belongs among the more developed countries. At the same time, it is bothered by regional inequalities, and Southern Italy is similar in its economic aspects to the other five members of this group. Italian participation in the MRP is directed toward the economic development of the South and toward the reduction of regional differences in personal income and employment opportunities.

The gross national product originating in agriculture in Italy in 1960 was 17 percent of the total, while agricultural employment was nearly a third of the total employment. In Turkey, agriculture produced 41 percent of gross product in 1962 and employed 76 percent of the active population. These two countries define the range of variance in industrialization within the MRP currently and in terms of target structures.

The ability of these countries to meet the very high rates of growth which they have projected for the planning period will require major changes in the techniques of production, as indicated by productivity targets, and in the structure of employment from agriculture to other sectors.

If Italy achieves its desired rate of growth and structural change for fifteen years, agricultural workers will decline by 1.8 million and will constitute only 18 percent of the labor force. Under similar conditions, the number of persons employed in Turkish agriculture will remain almost constant, but their share of total employment will drop to 54 percent. Each of the other participating countries expects comparable changes in the importance of this sector. With the exception of Turkey, all project an absolute decline in agricultural employment, based on major gains in agricultural productivity. These productivity targets range from an annual increase of 3.8 percent in Turkey to 7.0 percent in Yugoslavia. The Turkish strategy will be to maintain agricultural employment at its present level, while expanding employment in other labor-intensive sectors, such as construction and services.

Target growth rates in industrial output in three countries average 7 to 8 percent per year. In Turkey and Yugoslavia they are approximately 14 to 15 percent. The weight of employment versus productivity in achieving these target rates varies considerably among the five countries. Italy assumes only a minor gain in employment in the industrial sector—a gain of less than 2 percent per year. On the other hand, it assumes an increase of 5.2 percent in industrial productivity. In Turkey, the great weight is on the expansion of employment, for reasons already indicated, and it assumes more modest gains in productivity.

Table 1.

Gross National Product Per Capita and Sector of Origin (Base Year = 1960-62)

	Gross Product		Sector of Origin		
	Total[a]	Per capita[a]	Agriculture	Industry	Service
Turkey	$ 5.5	$192	41%	24%	35%
Yugoslavia	5.4	274	24	44	32
Portugal	2.6	292	24	41	34
Greece	3.2	383	25	25	50
Spain	11.5	370	26	32	42
Italy	35.1	690	17	41	42

a. In dollars at official rates.

Source: OECD Economic Surveys, Country Reports (Paris, 1963).

Table 2.

Economic Development Targets (Annual Rate of Growth)

	Output	Productivity	Employment
Turkey	7.0	3.75	2.4
Yugoslavia	9.5	8.5	1.0
Greece	6.3	6.0	.8
Spain	6.0	4.9	1.0
Italy	5.2%	4.3%	0.9%

Source: Preliminary Reports of the MRP. All data in these and subsequent tables, other than that contained in Table 1, are derived from the preliminary reports of the national MRP teams. They should be interpreted as approximate, since they are preliminary and because in some cases they have been adjusted to provide comparability. Portugal has been excluded in the absence of prescribed development targets.

Table 3.

Base Year and Target Employment: Percentage Distribution by Major Sector

	Base Year			Target Year		
	Agri-culture	Industry	Service	Agri-culture	Industry	Service
Turkey	76.3	10.9	12.8	54.2	18.9	26.8
Yugoslavia	57.3	25.6	17.1	38.5	36.5	25.0
Greece	50.7	19.9	29.4	37.8	25.7	36.5
Spain	41.3	31.4	27.3	27.4	37.4	35.2
Italy	29.9%	37.6%	32.5%	18.4%	42.4%	39.2%

Table 4.

Target Growth Rates: Employment and Productivity by Sector

	Employment			Productivity		
	Agri-culture	Industry	Service	Agri-culture	Industry	Service
Turkey	.1	6.3	7.6	3.8	3.5	1.4
Yugoslavia	-1.8	3.5	3.5	7.0	7.5	6.5
Greece	-1.5	2.8	2.5	5.0	6.3	4.5
Spain	-1.7	2.3	2.7	4.5	5.8	3.9
Italy	-2.7%	1.8%	2.2%	4.7%	5.2%	1.8%

OCCUPATIONAL STRUCTURES

The techniques employed for projecting occupational structures in the MRP are generally crude. They rely heavily on extrapolation from recent experience, adjusted by comparison with the occupational structures of other nations of technically advanced local establishments. In two countries they are partially based on extensive establishment surveys.

Methodological limitations are particularly great in these countries, where historical data are inadequate for extrapolation and the magnitude of change is great. On the other hand, they are able to tolerate a relatively large probable error, since the level of qualification in most occupational categories is much lower than desired. Further, there are extensive opportunities for skill substitution in these very tight labor markets, and physical limits on educational resources will ordinarily constrain any tendency toward over-investment, in particular when long-term planning is subject to continuous review.

With these limitations, occupational structures were projected on the basis of sector employment and productivity using from 5 to 10 economic sectors. In some cases, and in particular where central planning is extensive, these are based in more detailed studies of sub-sector productivity and output. The occupational detail used in projections within sectors varies widely among the national groups. Most teams have used from 6 to 10 occupational categories, while one projected requirements for 61 occupations.

A rather general indication of the magnitude and pattern of these changes is given in Table 5. These data have been aggregated from the more specific projections and obscure some significant detail.[3] These distributions are not precisely comparable due to differences in census classification of occupation and consequent problems of grouping on the OECD classification, in particular in Italy, where the classification system used is primarily educational rather than occupational. Nevertheless, they do indicate the magnitude and nature of change in occupational requirements. Each country anticipates a large decline in the relative importance of unskilled jobs, a large absolute and proportionate increase in the number of skilled workers, and a great relative gain in professional and technical occupations. As the educational standards related to these occupations are assumed to be constant, these changes reflect only the result of the employment shift to non-agricultural sectors and changes in technology in these sectors.

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[3] The broad occupation classifications used in Table 5 are described in the OECD document cited on page 64. They group occupations as defined in the ISCO manual with appropriate levels of education. Class A occupations are the professional and technical occupations generally requiring a university degree. Class B includes those technical occupations which require education beyond the secondary level. Specific occupations are differentiated within these two groups. Class C and D occupations contain clerical, sales and skilled workers, and unskilled workers. They relate to secondary and primary education, and specific occupations are not distinguished.

Table 5.

Present and Target Year Occupational Structures

	Base Year Occupations				Target Year Occupations			
	Class A	B	C	D	Class A	B	C	D
Turkey	1.6%	1.0%	13.5%	83.9%	2.8%	3.1%	27.3%	66.9%
Greece[a]	2.4	2.7	29.5	65.3	3.6	4.6	42.7	49.1
Spain	3.4	1.5	11.9	83.1	4.8	2.8	16.4	76.0
Italy	3.3	12.1	28.9	55.8	6.7	26.4	51.6	15.3

a. 18-year planning period.
Source: MRP Reports.

A specific example from the Turkish plan projects Class A requirements in 1977 as 427,000, compared with a base-year stock of 212,000. Adjusting for loss from the present stock, 323,000 entrants to the occupation will be required during the plan period. The requirements for technical (Class B) workers will increase at a greater rate, from 124,000 to 528,000, and require 438,000 entrants. The required entrants into these two groups of occupations include 160,000 engineers and industrial technicians; 190,000 teachers; and 87,000 physicians, nurses, and medical technicians.

Turkish requirements for skilled workers in the target year are projected to be nearly three times the present number, call for 3.4 million new workers, and absorb nearly half of all additions to the labor force. The increase in requirements at this occupational level is more than four times the potential output of the secondary schools, operating at present capacity through the fifteen years of the planning period.

EDUCATIONAL REQUIREMENTS

The output requirements of the educational system, implicit in occupational requirements, are accentuated by the fact that the level of educational attainment of the present population is low relative to the advanced countries. Large proportions of the labor force are not qualified by education for the occupations in which they are employed. In Spain, 78 percent of scientific and technical professional workers have had some education beyond the secondary level. Only 22 percent of other professional workers and 13 percent of technical workers have comparable education, and 87 percent of clerical and sales workers have only primary education. Levels as low as these require high proportions of qualified labor force entrants and extensive programs of informal education to raise the general qualification level to desired proportions.

With limited exceptions, the national planning teams have not attempted to define the requirements for non-formal education in specific terms or to cost it into national investment programs. In part, this is inherent in the planning concept, in that it is concerned with a long-term matching of education with growth requirements. Non-formal educational needs are in large part a short-term problem, being a function of the low educational level of the present manpower stock. With an adequate educational system, the requirements for on-the-job or other forms of vocational education will depend ultimately on its relative efficiency as a training form.

The current MRP emphasis on the formal education system is also attributable to the OECD concern with high level manpower, especially with scientific and technical personnel. Excepting the Greek plan, the disaggregation of occupational projections is limited to professional, technical, and administrative occupations. The lower- and middle-level requirements are projected only in terms of the general skill level. These are related to appropriate levels of formal education and to the educational stream (vocational, technical, or general) at the secondary school level. They provide no adequate basis for the short- or medium-term planning of non-formal vocational training.

In a narrow application of manpower criteria, the required output at each level of the educational system and from each educational stream would be a function of the inputs required at the next higher level and the requirements for manpower skills from each level. These outputs would define the minimal requirements on the educational system stemming from economic development objectives.

In the MRP experience, these requirements are supplemented by other social objectives which demand education. They include social mobility and social participation, citizenship skills, and the less precise objective of "self-enrichment." Considering the labor force participation rates of men, and the fact that most of these objectives are also aspects of vocational education, their quantitative implication is limited to an expansion of educational requirements in proportion to the number of women who will not enter the labor force. In the traditional sectors of developing countries such as Turkey and Yugoslavia, labor force participation rates for educated women are very high, and these supplements do not appreciably affect the output requirements prescribed by manpower criteria.

Qualitatively, they may affect the structure of curricula and the nature of course content, but the degree of complementarity between vocational and non-vocational needs is such that this effect is not likely to be great. Planning, in the MRP, has tended to offset rather than reinforce the traditional tendency to specialize and fragment education. Currently, many specialized programs are terminal, discouraging entrance and encouraging excessive flows into general education.

The social requirements for education are typically treated as supplements to manpower requirements, except in cases where they have clearly established priorities, as in a social prescription for universal primary education. When educational resources are very limited, non-vocational requirements may prevent the attainment of manpower objectives. Such a situation is represented by Turkey, where one-third of all villages have no primary school. The national commitment to universal primary education and the allocation of teachers to this purpose will restrict the growth of secondary education to a level below that defined by manpower needs.

The educational targets established by the MRP units reflect this combination of vocational and non-vocational requirements. In some cases, they exceed manpower requirements by the amount of the non-complementary, non-vocational educational demand. In other situations, they are determined by resource limits and non-vocational requirements at levels inadequate for achieving manpower targets. In general, however, they do reflect manpower needs in both the level and structure of educational output, at levels above primary education.

Table 6.

Educational Targets: Percentage of School Age Population Enrolled by Level of Education

	Primary[a]		Secondary		Higher	
	Base	Target	Base	Target	Base	Target
Turkey	73	100	18	23	3.9	7.2
Yugoslavia	95	98	37	99	4.3	15.4
Greece	98[b]	99[b]	37	51	3.5	5.4
Spain	88	99	15	48	4.2	6.4
Italy	82	100	10	16	(c)	(c)

a. Primary and secondary categories are not strictly comparable in view of international differences in educational structures and overlapping in some national systems.
b. Equal entrants.
c. Not comparable.

The pattern of change in educational requirements is similar in each country—the extension of primary education to all children, a large relative expansion of higher education, and a large absolute increase in secondary school enrollments. The differences are products of educational situations unique to specific countries. For example, the greater than average increase in higher education in Yugoslavia results from an early emphasis on the development of professional level

(Class A) skills. The present emphasis is directed toward a similar expansion of technical (Class B) skills.

The small relative increase in Turkish secondary education reflects the effect of a high rate of population growth and the fact that these schools are currently overextended. The extension of primary education will double present enrollments, and secondary enrollments will be more than twice the base year level by 1977. The present teacher/student ratio is 1 to 65 in first cycle secondary education, and the target ratio is 1 to 35. This improvement and the enrollment increase will require five times the present number of teachers.

The effects of changing manpower requirements on the structure of education are best illustrated in specific examples, although the pattern of change is from general education to technical and vocational education in all countries. Table 7 shows the present capacity of specified faculties in higher and secondary education in Greece, in relation to required output for the period 1962–79, and reflects the present imbalance of that system in relation to the structure of development. In Turkey, the number of graduates for *Lycee* (upper secondary school) in 1977 will be 2.6 times the 1962 output. Graduates from technical schools at the same level will be 15.4 times the base year number. The number of graduates from general secondary education in Spain is expected to increase in the planning period to 5.9 times the base year value, while the output of technical and vocational secondary schools will increase 12.3 and 18.9 times.

The costs of educational change have been estimated by costing enrollments at each level of education and for each type of institution or faculty. In some countries, notably Spain and Greece, unit costs have been differentiated by geographic regions. Enrollments are derived from output requirements by adjusting for "wastage" and unit costs determined on the basis of student-teacher ratios and area per student coefficients. These include administrative, equipment, maintenance, and depreciation costs.

All cost coefficients are assumed to be variable, and the major difficulties in "system" planning are in the choice of target values for these input coefficients. In developing countries, they are subject to change over a wide range of

Table 7.

Greece: Graduates from Specified Faculties at Present Capacity and the Number of Graduates Required, 1962-79.

	Graduates	Requirements	Deficit
Higher education			
Civil Engineering	3,830	5,840	2,010
Economics & B. A.	14,050	18,210	4,160
Agriculture	3,860	3,020	- 840
Theology	2,100	1,470	- 630
Middle technical and vocational schools			
Bookkeepers	8,740	22,250	13,510
Nurses	7,650	11,860	4,210
Foremen (Electrical)	16,100	7,000	-9,100

values, and educational efficiency criteria are not well defined. Wastage rates are often very high in rural areas and are functions of quite different factors, including parental attitudes and the availability, quality, and techniques of education. Similarly, there are no explicit standards for determining optimal student/teacher ratios or classroom space requirements in different types of educational situations. The MRP teams have generally extrapolated from existing data, assuming some rather arbitrary rate of increase in educational productivity. Similarly, factor prices have been associated with the target growth rates in GNP adjusted on the basis of policy criteria, to influence factor supply.

The educational investment requirements derived in this way are expressed in Table 8 as an index of change and as a percentage of GNP in the base period and target year. The target year proportions of GNP allocated to education are impressive in relation to present expenditures in these and many more advanced countries. They are even more impressive in the light of the limited resources and development needs of these countries.

Table 8.

Expenditure on Education: Index of Change Relative to GNP

	Index of Change	Percent of GNP	
	Base Year = 100	Base Year	Target Year
Turkey	302	3.6%	4.8%
Yugoslavia	481	3.8	5.2
Portugal	523	1.8	(n.a.)
Greece	368	2.1	3.2
Spain	469	1.8	4.0
Italy	271	4.3	7.1

COMMENT ON METHODOLOGY

This very brief and general statement of procedure cannot do justice to the extensive efforts of these national teams. They began with little precedent and a very limited body of research relating to the more important of the variables involved. Empirical data in most developing countries is always incomplete, often inconsistent, and rarely continuous over periods long enough to justify extrapolation or identify relationships. In no area of inquiry is this more evident than in the manpower field, and in these countries education data are nearly as limited.

One useful product of the MRP has been to stimulate interest in extending and improving the basic statistical series necessary to manpower and educational planning at the national level and in developing an international standard for census statistics for Western European countries. Many of the limitations of the present work could be eliminated or reduced by more adequate data. Further, the limited comparability of planning results and research findings is primarily a function of data limitations.

Finally, one should note, the MRP was developed as a policy-directed planning operation, rather than as a research effort. Many of the omissions or limits of scope were dictated by constraints of time arising from the urgent need for criteria for policy formation. Omissions such as regional differences, factor mobility and utilization rates, and non-formal education, are the subjects of the current phase of the project. Intensive research into fundamental relationships which have been treated by approximate methods has been extended in the national teams, by the Human Resource Development Fellows, and by other projects of the OECD, such as that concerned with educational building standards, techniques, and costs.

Accepting these constraints of time and data, one must say that the project has been quite successful in achieving its prescribed objectives. There are, however, several rather fundamental problems of concept and technique which merit further discussion. One of these relates to the limitations on the long-term projection of manpower requirements and the implications of these limitations in the context of educational planning. A second concerns the problem of defining the degree of complementarity between manpower and other social requirements of the educational system and the criteria for establishing priorities between conflicting objectives. The third problem is that of establishing a relationship between an occupational classification, a set of performance functions, and the educational means for developing functional capacities.

The problem of projecting the occupational structure of manpower requirements over periods as long as ten to twenty years has been the subject of extensive discussion to which this paper can add little more than a comment. It has been noted that the techniques employed in the MRP and elsewhere depend heavily on extrapolation of past trends, tempered with judgment concerning the probable changes in the techniques and organization of production. These judgments are made on the basis of established parameters, such as target productivity rates, levels of employment, and rates of investment, and reinforced by reference to foreign experience of special domestic experience. There is little question that historical relationships offer a tenuous base for projecting requirements for certain occupations in a situation which is defined in terms of rapid change. There is, however, a question as to what proportion of relevant occupational requirements are subject to change that is not predictable with reasonable tolerance for error.

The occupations which are relevant to planning considerations are those for which a significant lead time is required in order to change the supply. In a country with universal secondary education and the standards of occupational qualifications assumed in the MRP, the maximum lead time required for skilled craftsmen and technicians would be two to three years, plus the time required for tooling up the educational system. In this situation, the principal criterion for educational planning is demographic rather than vocational, and manpower planning for these occupations requires no more than medium-term projections. If secondary education is not universal, the required level of output from secondary schools would be defined by the difference between the requirements for unskilled labor and all other manpower.

The higher-level occupations may require a lead time as long as ten years, but a very large proportion of these occupations is not sensitive to changes in techniques of production or substitution effects. For example, the net change in requirements for Class A occupations from 1961 to 1974, according to Greek projections, is 50,000. Of this total, 42,000 are artists, teachers, surveyors, agricultural extension agents, physicians, dentists, public administrators, accountants, and lawyers. One might add to this group a large proportion of physical scientists who are engaged in research and development activities. A similar relationship exists in the projection of Class B (technician level) requirements. Fifty-two percent of the net increase projected are in eight occupations of the "insensitive" type; 42 percent are primary school teachers, nurses and medical technicians, marine officers, and interpreters.

Service occupations of this type are not subject to rapid change in technique. The requirements for these skills are determined in the main by changes in the size of the population, the level of income, sector output, or other relatively stable variables. The proportionate importance of these occupations does serve to reduce the range of probable error in long-term projection. Nevertheless, the technical problems involved in projecting requirements for the residual group remain great enough to justify skepticism about their validity as planning criteria.

The present technique treats the quality of human resources as complements of differentiated capital resources. It assumes a unique relationship between one occupational structure and a given level of technology or set of production techniques. The choice of capital structures and capital investment requirements which determine the quality of capital determines simultaneously the quality of complementary human resource requirements. In less absolute form, the degree of complementarity between capital-embodied and labor-embodied technology is significantly greater than the possibilities for substitution.

It assumes that in the process of industrial development an establishment or subsector advances along a technological path or through a series of production functions and consequently through a range of relevant occupational structures. The choice of production function at any point in time is indicated by the level of output and capital characteristics. Projections of manpower requirements involve the identification of the nature of complementarity and its application to a set of prescribed targets for output, investment, and employment.

Clearly, there is very little empirical evidence concerning this basic relationship, although the use of advanced establishment surveys and other special studies in MRP countries does suggest that the technique can provide "workable" solutions in which the range of probable error is not intolerable for the purpose at hand. There is a need for much more extensive empirical research at the establishment level or in detailed subsectors before the range of probable error can be evaluated.

A second area in which the current technique is limited is that of defining the relationship between education and economic development in operational terms. Three aspects of this problem have been particularly troublesome in the Mediterranean experience. One involves the importance of the planning context, another the problem of quantification of non-skill characteristics, and the third the criteria for establishing priorities among multiple objectives.

The process of relating education to development requires an explicit definition of development targets. The precision of an established relationship depends on the degree of precision with which specific objectives and specific processes of change can be defined. Three of the Mediterranean countries have well developed central planning functions. The major allocational decision and the major priority choices are determined in this framework and "give" to the educational planner.

In contrast, Portugal has no central planning agency, and its development goals are defined only in the most gross form as an annual rate of growth in GNP. In this case, an attempt to plan education in relation to development requires the inference of a future economic and social structure from a single criterion, the rate of growth. The Portuguese team has not attempted to do so, but has concentrated its effort on the systems relationships and related the level of educational requirements to changes in population and the size of the labor force.

Whether it is possible to infer structural change without errors too gross to be acceptable for educational planning is of particular importance to many of the more advanced countries without central planning. The Mediterranean experience, in particular the experience of Spain, where the global educational plan was completed prior to the development of a central development plan and subsequently evaluated against it, suggests that the possibilities for educational planning without central planning are greater than assumed by the Portuguese.

The range of allocational and technical choice appropriate to a growth rate of 6 or 7 percent from an existing base is not unlimited. The process of industrialization does have implications that are independent of cultural differences. The magnitude of errors resulting from dependence on assumed patterns of development appear likely to be less than if educational development were left to the forces of tradition, imperfect markets, or random estimates. Again, this question needs much more extensive empirical tests than those derived from the Mediterranean experience.

The problem of the quantification of development related human characteristics and that of establishing priorities among the multiple requirements from the educational systems have a common ground. One aspect concerns the difficulty of relating educational forms to the development of particular human characteristics and capacities. The other is the identification of and the degree of complementarity between characteristics and alternative uses.

The MRP teams have recognized repeatedly the importance of non-skill vocational characteristics such as mobility, motivation, and innovational capacity, but have made no attempt to incorporate them as planning criteria. They have used occupational classifications with their functional skill implications, except where explicit social prescriptions were in conflict. Clearly this is a result of the ease with which one set of characteristics can be quantified and the current impossibility of quantifying the other. The second are therefore subsumed in the first.

In view of the impact of tradition on curricula and course content, this assumption offers a source of great possible error. Planning techniques require an extensive concern with the appropriateness of educational content to the specific capabilities related to development. Further, it is in the form and content of education that complementary requirements are identified and many conflicting requirements reconciled. The MRP teams have avoided an explicit concern with educational content, partly for reasons of expediency, but in part because their policy implications are not obvious and because they are politically sensitive in traditional societies.

The third central problem of instrumental education planning is definitional. It stems from the inadequacy of occupational classification in defining functional requirements and of definitions of educational curricula in describing qualification. One element of this problem is the degree of heterogeneity of function within standard occupational classifications. The other is the extent to which definitions of educational curricula differ in regard to prescribed educational content.

In the first instance, the occupational classification of managers includes a wide variety of performance functions, requiring quite different levels and types of skills. No identification of this occupational category in terms of appropriate preparation can be operational without more precise definitions of these varied functional roles.

Improvement of the current methodology will require the development of a system of occupational classifications, preferably within the framework of an existing standard system, that are capable of being expressed directly in terms of appropriate education or preparation. The development of a classification system of this type will require empirical studies of actual job-performance and skill requirements in those occupations where variation in function is characteristic.

Conversely, educational curricula, in considerable degree, are functions of tradition, and the educational content represented by curricula definitions vary widely, both within and among countries. If projections of occupational structures are to be treated as determinants of educational input requirements, it will be necessary to define the inputs required for appropriate preparation far more precisely than is currently possible. One possible approach is to develop international data which will permit comparisons, in standard terms, of the actual content of nominally similar educational programs. These comparisons would provide at least a first basis for evaluating the relevance of content to function. They would also provide a more adequate basis for quantifying and costing the educational resources necessary to expanded outputs of required manpower.

It was suggested above that the Mediterranean experience has underscored a number of very important problems of analysis of the internal relationship of the educational systems. These are not conceptual problems; rather, they stem from an absence of relevant research as a basis for quantifying relationships. They include in particular the determinants of student wastage and educational production functions. These are subject to current study in all Western European countries with a planning commitment.

The more important contribution of the MRP and the present activities of the four northern countries emulating it is in their attempt to adapt education to instrumental purposes in a democratic context.

OCCUPATION-EDUCATION RELATIONSHIPS—LESSONS FROM LESS DEVELOPED COUNTRIES

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Several characteristics of less developed countries are interesting to the student of occupation-education relationships:

(a) The economies of less developed countries may be simpler than advanced economies, thus providing a more easily understood laboratory for social science research.

(b) Similarly, the low incomes of less developed countries should make for an austerity of resource allocation that will reveal occupation-education relationships more clearly than is possible in the more redundant advanced economy. Austerity should be particularly necessary for education, which is usually the single largest public expenditure in a less developed country.

(c) Less developed countries may be undergoing (or expecting) more rapid structural shifts in economic composition. Structural shifts, in contrast to incremental growth in all sectors, test the muscle of any analytic approach, including that of manpower planning.

I am one of several who have succumbed to the foregoing and other siren calls of the less developed countries. That these particular charms are elusive, sometimes even false, does not detract from other rewards.

People interested in economic and social development have devoted increasing attention to education and training as key building blocks in strategies of national development. Fortunately, the literature dealing with less developed countries is keeping up with this worldwide attention. While I won't undertake to review that literature here, I would like to mention a splendid collection of country studies edited by Harbison and Myers. A number of other case studies of merit are only in report form—for example, Dr. Eli Ginzberg's

"The Development of Human Resources in Venezuela" and several UNESCO mission reports.

I propose first to discuss how occupation-education information is of interest to those concerned with the economic growth of less developed countries, this by means of a schematic diagram of a process which translates economic development targets into educational and training requirements. Along the way, I shall consider how quantitative and qualitative factors in less developed countries influence planners' abilities to harness manpower more effectively for development. Finally, I shall enumerate some of the ways in which the experience being accumulated in less developed countries may be of relevance for the situation in the United States.

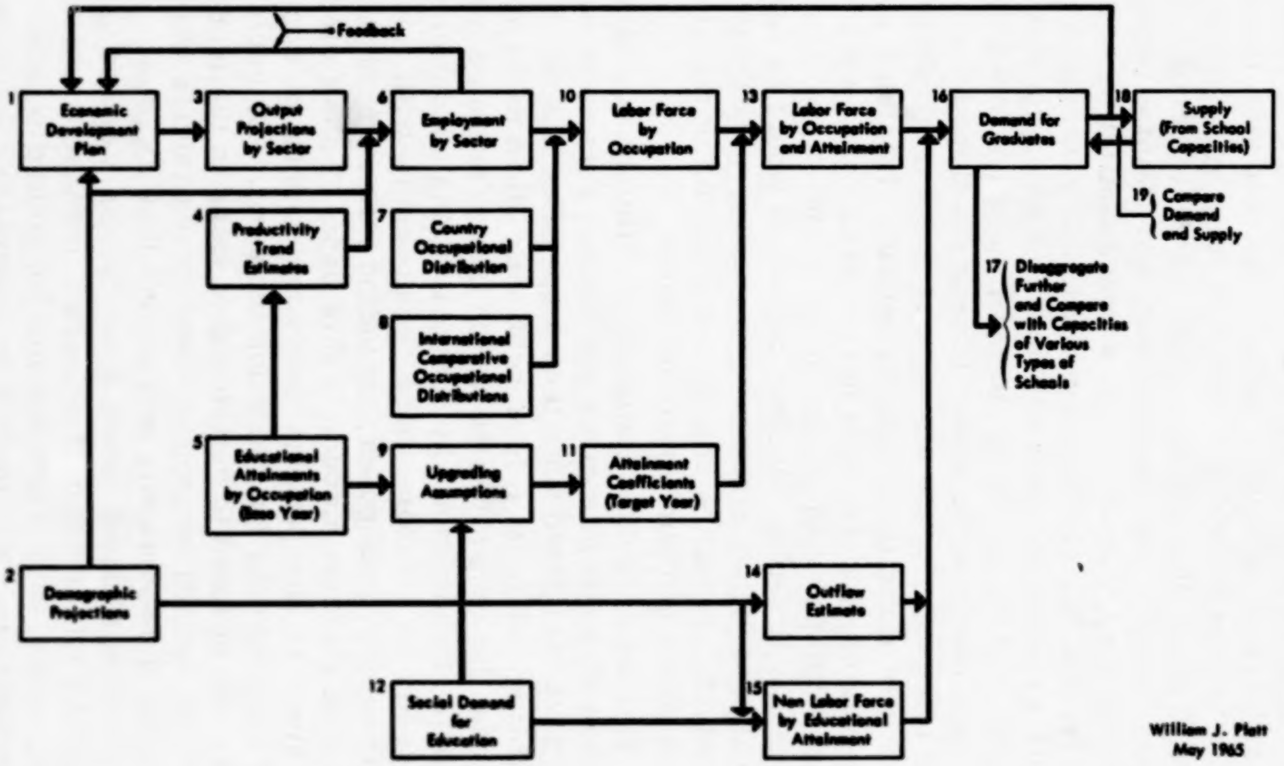
A few definitions may be helpful. Precision in defining less developed countries is not necessary for purposes of this paper; perhaps a per capita income below approximately $350 per year will serve. Another definition would be Group I and II countries in the Harbison-Myers index, plus those of Group III, which, through economic dualism, suffer massive underdevelopment of their human resources.

The educational attainment coefficient is defined as the fraction of people in a given population, sector, or occupation who have completed more than a specified number of years of schooling. Figure 1 is a schematic diagram of a planning process the objectives of which are to estimate a country's manpower requirements by occupation and educational attainment and to compare these requirements with the probable future supply of manpower, including inflows from the schools and possibly from abroad. In this paper, I shall discuss only the steps in the process that bear directly on occupational data requirements for education planning. Of course, entire books are devoted to certain other steps in the process, like those of setting economic development targets (boxes 1 and 3), making demographic projections (box 2), etc.

Economic development plans (boxes 1 and 3) usually indicate the achievement of a desired increase in per capita income, along with a certain income redistribution. Minimal considerations must include an internally consistent and implementable program of savings, investment, and consumption, as well as maintenance of a viable foreign exchange position (after allowing for expected foreign assistance). I have found

FIGURE 1

SCHEMATIC OF MANPOWER PLANNING APPROACH


Feedback
1 Economic Development Plan
3 Output Projections by Sector
6 Employment by Sector
10 Labor Force by Occupation
13 Labor Force by Occupation and Attainment
16 Demand for Graduates
18 Supply (From School Capacities)
19 Compare Demand and Supply
4 Productivity Trend Estimates
7 Country Occupational Distribution
8 International Comparative Occupational Distributions
17 Disaggregate Further and Compare with Capacities of Various Types of Schools
5 Educational Attainments by Occupation (Base Year)
9 Upgrading Assumptions
11 Attainment Coefficients (Target Year)
2 Demographic Projections
14 Outflow Estimate
12 Social Demand for Education
15 Non Labor Force by Educational Attainment

William J. Platt
May 1965

that in surprisingly few cases are the employment implications of development targets (box 6) systematically considered. Instead, the national and international cult of development planners has been preoccupied with fiscal considerations, almost to the exclusion of manpower considerations. True, the data base in less developed countries does not permit much precision in translating output into employment terms. This is because manpower in these countries has always appeared to be relatively abundant, at least until the recent appreciation of labor shortages on the middle and high levels. Employment statistics are infrequent and unreliable; often one is forced to go back to the last decennial census to get firm benchmarks of actual employment by sector. Underemployment is endemic. Unemployment is often disguised either by underemployment or by an understatement in the labor force participation rate, and thus appears artificially low.

These uncertainties make it difficult to estimate productivity trends (box 4), but clearly that step is essential, if future employment is to be projected. Productivity changes in a given sector will be affected by the scale of operations, by managerial efficiency, by the technology employed, and by the skill and educational attainments of the employees. In a country undergoing a major structural change in economic emphasis, productivity growth in the leading sector(s) may be more influenced, at least in the short run, by economies of scale than by any of the other factors.

Once employment by sector (box 6) is obtained, a review of the output targets may be needed. For example, when the Thais translated 1980 output goals into employment terms, taking into account demographic and productivity factors, they found that the agricultural labor force will be seven million more than it was in 1960—despite an anticipated sharp decline in the proportion of the labor force engaged in agriculture. By thus employment implications, the analysis has allowed the Thais to focus on a kind of development planning that will help make such an agricultural labor force economically viable. Or, if this strategy proves not to be feasible, the Thais can examine the prospects for a faster re-employment the agricultural labor force in other sectors of the economy.

To determine educational and training requirements, we need data on employment by occupation, not by economic sector, because occupational category is a more direct determinant of appropriate educational qualifications than is the industry sector. Boxes 7, 8, and 10 deal with the process of transforming sectoral to occupational data. The occupational composition for the most recent (often census) year must be obtained and then updated, on the basis of international comparisons or domestic trends, to a composition for the target year within each sector. An example of one sector for Chile is given in Table 1. The categories could be further disaggregated for key occupations or key sectors.

Table 1.

	Percent of Labor Force Employed in Manufacturing	
Occupation	1960 (actual)	1970 (estimated)
Professional	1.35	3.10
Administrative	2.84	3.00
Clerical	5.50	8.00
Salesmen	0.48	1.00
Farmers, fishermen	2.14	1.00
Miners	0.05	
Transport workers	1.67	1.67
Artisans, craftsmen	63.91	54.81
Operators	19.48	25.00
Laborers	1.22	1.22
Service workers	1.20	1.20
Other	0.16	
	100.00	100.00

The occupational percentage breakdown may now be applied to sector employment (box 6) to obtain employment by occupation (box 10). It is probably more convenient from this point on to use total labor force figures, rather than employed labor force only. This may be done by dividing employment figures by the expected percent employed, after making certain that the resulting total labor force agrees with demographic projections of the labor force.

I now turn to the heart of the process of estimating educational requirements: dealing with educational attainments (boxes 5, 9, 11, and 13). In his chapter on "Iran's Experience with Manpower Planning," Baldwin speaks of the "looseness" of demand-supply relations in manpower programing. He points to the difficulties and uncertainties of what he calls "gearing" demand-supply programing from an occupational perspective. Parnes wisely has also expressed caution in his chapter on "Relation of Occupation to Educational Qualification." He concludes, however, as I do, that the translation of occupational needs into educational requirements is worthwhile, even though the process is riddled with ambiguities. The method described below has been designed to accept some of the "looseness" of demand-supply relations; and it bases the "gearing" on empirical input-output relationships, rather than on the educational qualifications a person should theoretically possess if he is to belong to a given occupation.

The first step is to calibrate the educational attainments to some base year. This should be done for the population as a whole, for the labor force, and for each occupation. It is common even in less developed countries for the necessary basic information to be gathered in a decennial census. The reason for calibration is a pragmatic one. The argument is that a certain economic output occurred in the base year by virtue of the work of the existing labor force of that year. The labor force was differentiated by occupation and educational attainment in a certain pattern, which we shall call "stock of manpower." In short, we can trace an empirical connection between the economic output and the manpower input as described by the base year stock. This method says nothing of the optimality of the stock's mix in the base year. No doubt some other occupational mix and higher educational attainment would have produced a higher output, but we are interested first in an empirical, not a theoretical, connection. If we build upon an empirical base for future projections, at least we can always return, through whatever modifying assumptions are made, to quantities that have a reliable association with an actual economic performance.

Table 2.

1960 Educational Attainment Coefficients in Thailand, by Occupation

	Percent Completing Education Shown			
Occupation	University	Secondary	Elementary	Less than elementary
Farmers, fishermen, forestry	0.01	0.54	6.00	100.00
Professional, technical, and related	6.05	53.00	77.00	100.00
Administrative, executive, and managerial	4.65	46.00	64.00	100.00
Clerical	2.33	28.00	68.00	100.00
Sales	0.10	1.70	12.50	100.00
Miners, quarryman	0.112	7.40	23.50	100.00
Workers in transport and communications	0.19	2.00	17.00	100.00
Craftsmen, production	0.225	1.30	9.00	100.00
Service, sport, and recreation	0.235	2.00	9.00	100.00
Not elsewhere classified	0.112	2.00	25.00	100.00

Source: Calculated from special analyses of 1960 Census returns.

That educational attainments are highly sensitive to occupation is shown in Table 2. The highest attainment coefficients exceed the lowest by a factor of twenty or more at the secondary level and by a factor of ten at the elementary level. I have found it useful to employ a cumulative figure for attainment coefficient—that is, to express the fraction who have completed *more than* a given level of schooling. The cumulative allows easy comparisons between occupations, between countries, and on time-trend bases, even when the reported grade level intervals differ. Figures 2 and 3 show cumulative educational attainment of the total populations and of the total labor forces, respectively, for several countries. Figures 4, 5, and 6 give some international comparisons for the occupational categories of professional, administrative, and clerical workers, respectively. Note that attainments in less developed countries are considerably below those of advanced economies. The attainment gap is less, however, for high- and middle-level occupations than for the population as a whole. Such a finding is not unexpected; it is another manifestation of economic dualism.

This method may seem to place undue emphasis on the quantitative grade level completed and to neglect the quality of education offered. The danger of such an emphasis, however, is lessened by the fact that all countries are subject, in varying degrees, to the modernizing, upgrading, and equalizing effects of the educational marketplace. Employers of graduates, international student and faculty exchanges, and bilateral and multilateral technical assistance to education all contribute significantly to a constant upgrading of educational *quality* for a given *quantitative* level of attainment.

Yet despite these constructive forces for qualitative improvement, there can be serious lags and gaps. Harbison and Myers have cautioned us that their index of human resource development is occasionally misleading because education in certain countries is qualitatively equivalent to a lower attainment level in the advanced economies. More work should be done to permit objective measures of these phenomena. I believe it is possible to approach this goal by setting up a typology of methods of instruction. The typology might be ordered along a scale, with rote memory at one extreme and problem-solving at the other. The rote memory pole represents education in less developed countries that is still straitjacketed by lectures, note-taking, memorization, and reproduction of facts and principles on demand. Education in these countries needs to move toward the other end of the

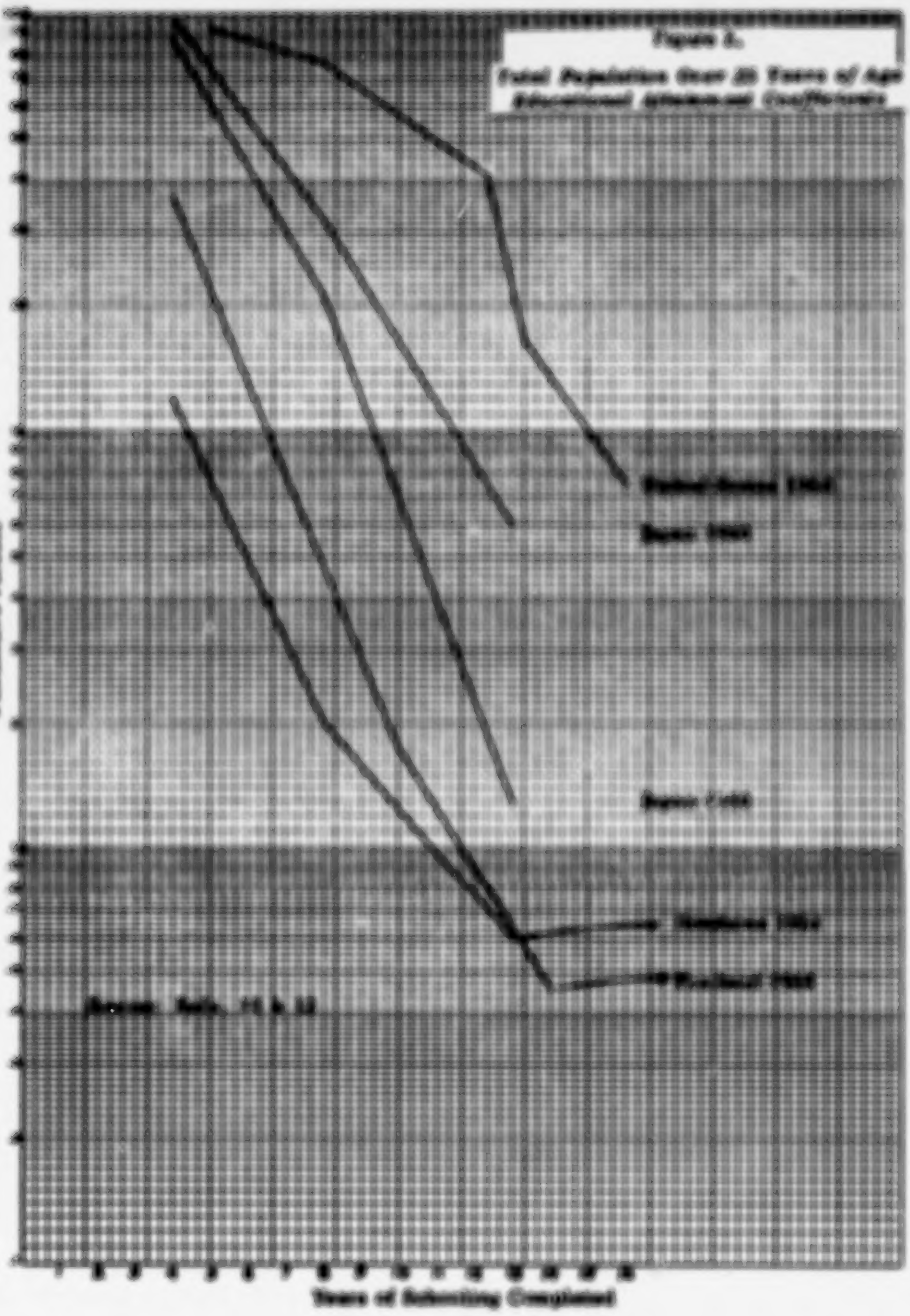


Figure 1.
Total Population Over 25 Years of Age
Educational Attainment Coefficients
Cumulative Percent
Years of Schooling Completed

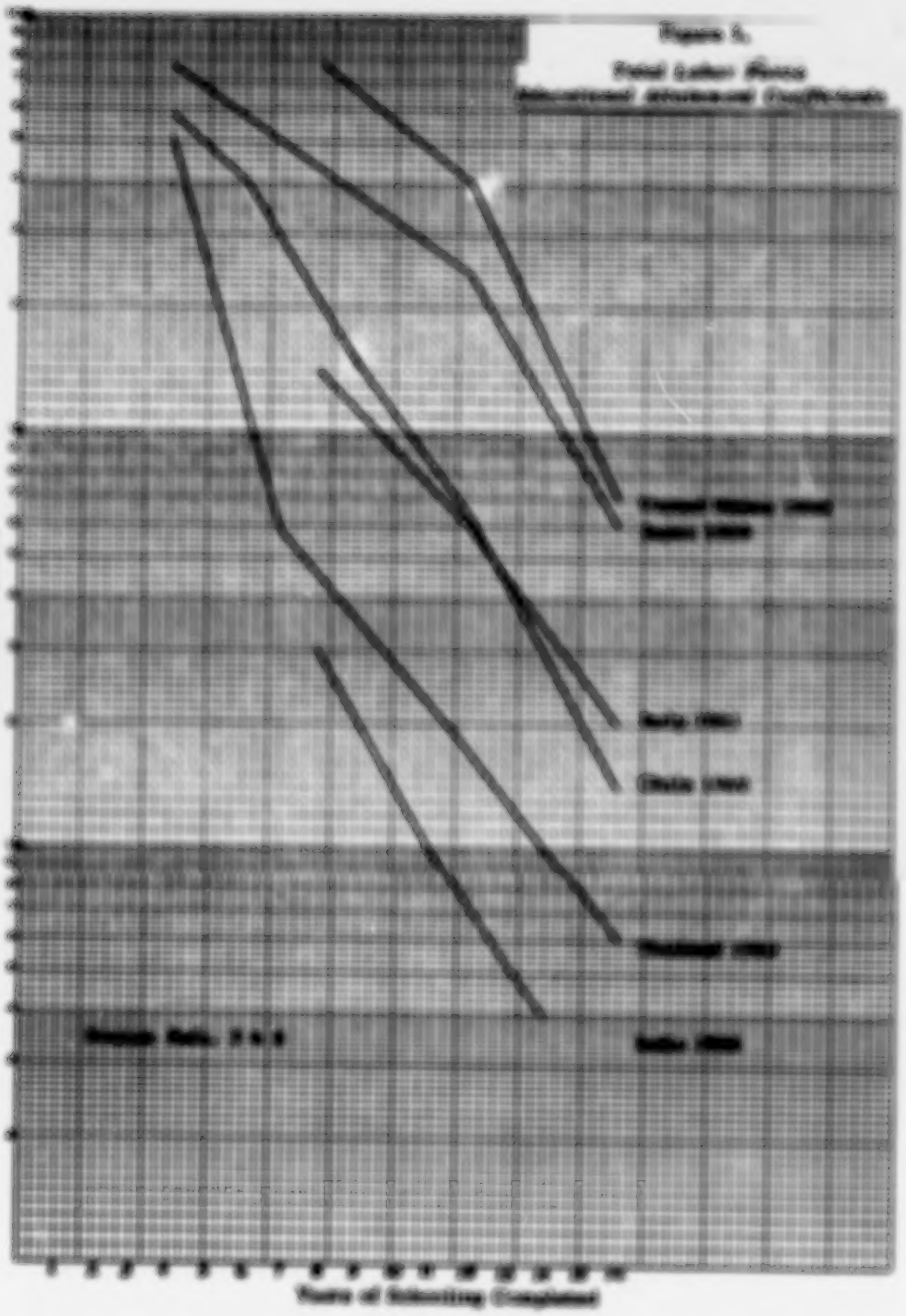


Figure 5.

Total Labor Force

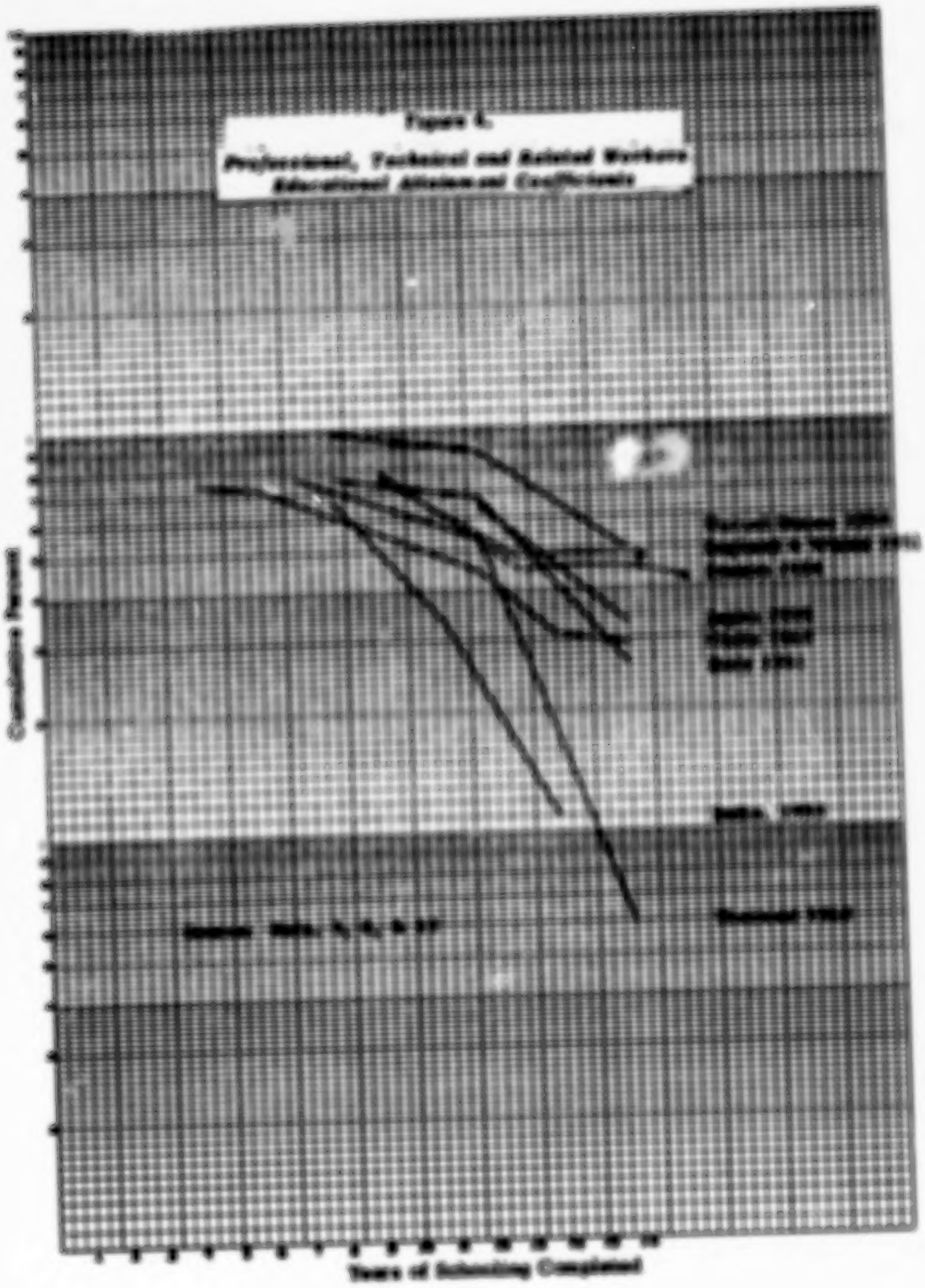


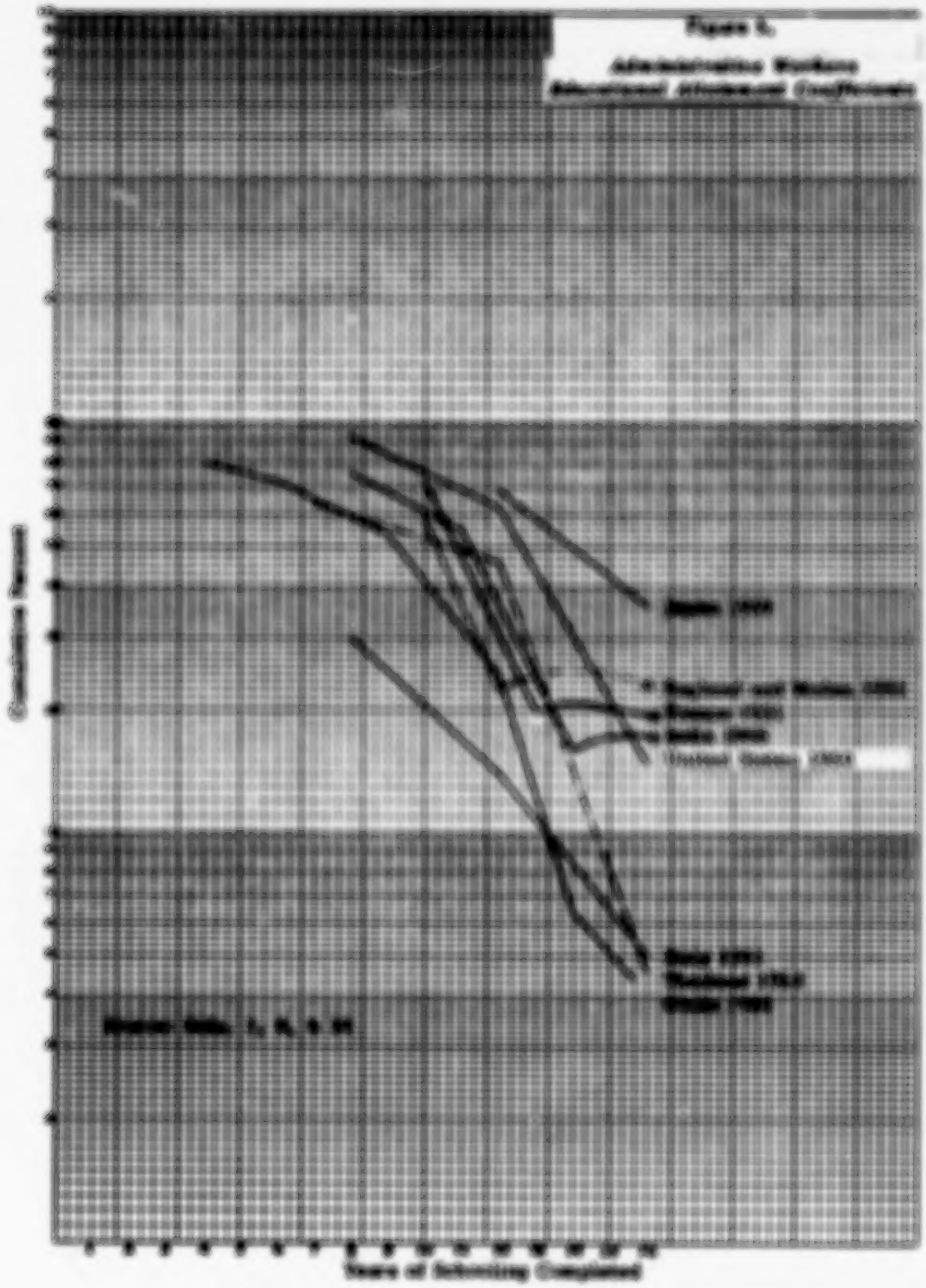
Figure 4.

Professional, Technical and Related Workers Educational Attainment Coefficients

Figure 5.

Administrative Workers

Educational Attainment Coefficients



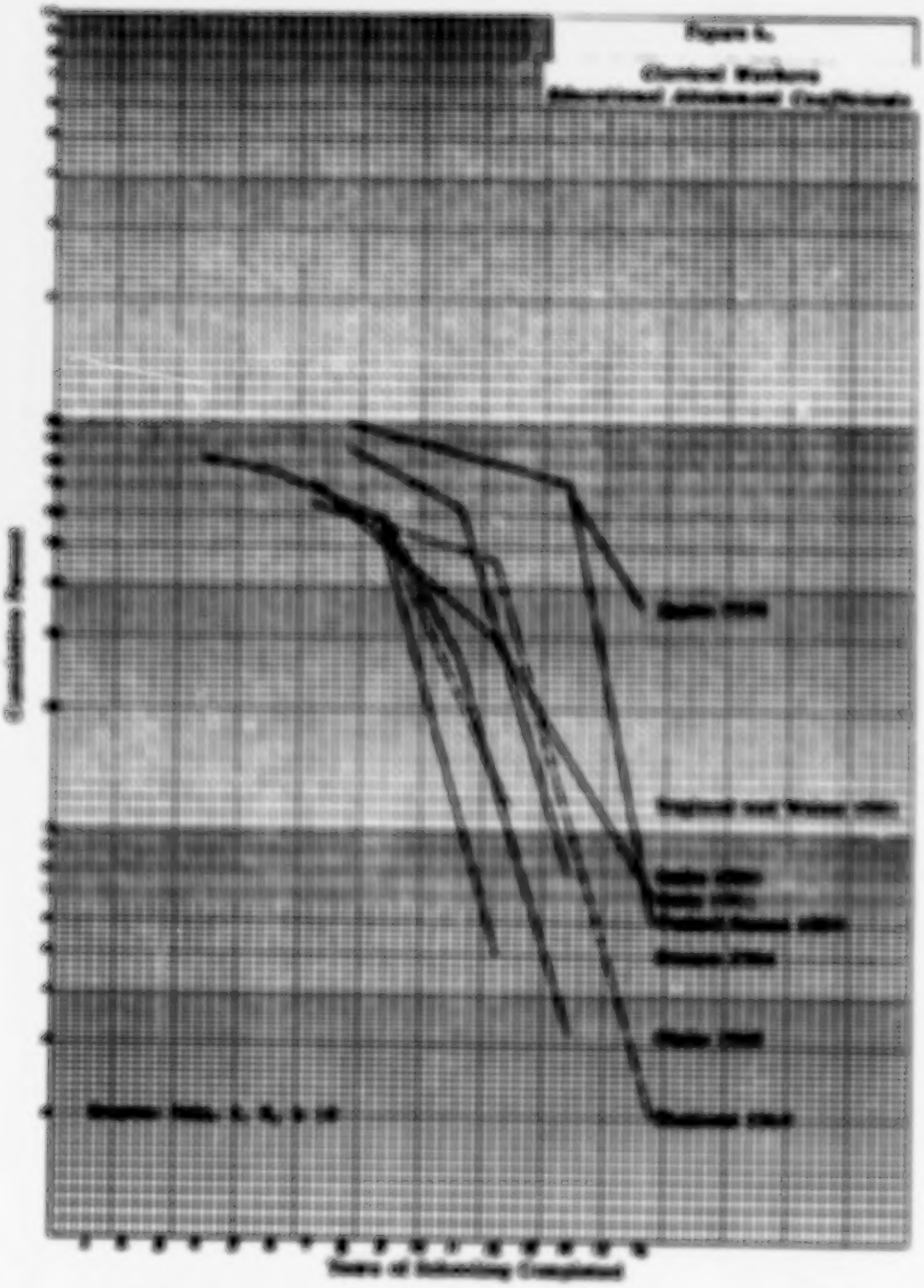


Figure [illegible].

Clerical Workers

Educational Attainment Coefficients

scale, where instruction is concerned with the "why" of learning and with critical thinking by students. Painful reforms are necessary to make this qualitative transformation. However, if students of manpower and education can achieve objective measurement of the qualitative factors, perhaps the incentive for such reform will be increased.

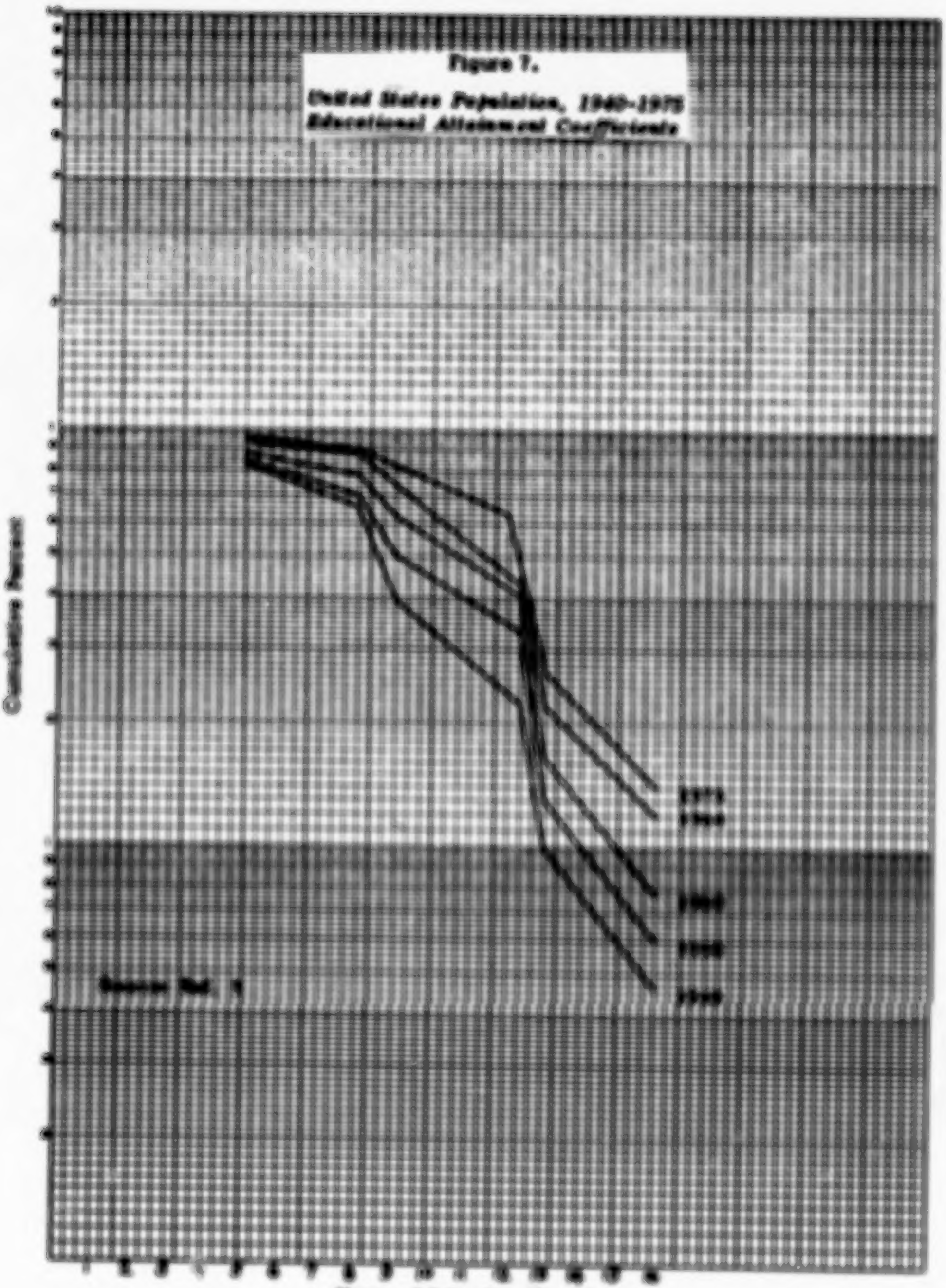
The next step is to introduce assumptions for the upgrading of future attainment levels (box 9). Figure 7 shows how these levels in the United States have been climbing since 1940. The 1975 estimate is that of the U.S. Department of Labor, published in the 1965 Manpower Report of the President. Because of the worldwide educational crisis, educational investments are generally growing more rapidly than population or gross national product. In less developed countries, the demand is most often for universal primary education and for expansion of prestigious higher education. Middle-level training usually lacks a constituency. Yet middle-level, trainable skilled and semi-skilled personnel is perhaps the scarcest resource less developed countries striving to achieve economic growth.

It is possible to bypass the step of upgrading attainment levels on the grounds that, if attainments in the base year produced an actual output, the same attainments for the new occupational mix will perform similarly for the target year. This assumption would represent a minimal demand on education, neglecting the contribution that education must make to the productivity increases necessary for growth. Upgrading can be pursued on an across-the-board or an occupational basis. However upgraded, attainment coefficients for the target year applied to the labor force projections will yield data on the future labor force by occupational attainment.

We now have the projected labor force in "stock," that is, differentiated by occupation and by educational attainment. If we are interested in the total demand on the educational system, we must also determine that outside the labor force (boxes 12 and 15). Some means must be found for objectively stating social and political demands for schooling, insofar as these go beyond economic demand. This is not easy to do. Quantifying "economic" demand seems to help policy-makers project other demands more explicitly.

Figure 7.

United States Population, 1940-1975
Educational Attainment Coefficients



Source: Ref. 1

The *stocks* are inventories as of a target year. Educational planning requires *flows* of graduates to satisfy a needed stock. Stock may be converted to flows (box 16) from the school system and from in-migration, by allowing for the projected growth in the stock and for outflows (box 14) due to deaths and other attrition.

At this stage demand may finally be compared with supply on the basis of the estimated future capacity of various school levels (box 18). It may be necessary to disaggregate the occupational requirements somewhat further (box 17) in order to determine specific school capacity needs.

The above procedure stresses working with control totals —total economic activity, total labor force—while differentiating as much as possible within the reliability of available data. Working with control totals guards against omissions and double counting. Working with empirical coefficients permits a return to actual base-year figures, if calculated requirements yield results that appear to need recycling.

I turn briefly now to the possibilities for transferring some of the planning approaches used abroad to the domestic scene. In comparison with other countries, the United States has a very rich educational commitment—both qualitatively, in diversification of subject matter, and quantitatively, in educational attainment. So our problem of preparing for the future—of understanding the "futurity" of present educational and training investments—is quite different from the educational issues in less developed countries.

Manpower analyses in the United States have been able to concentrate largely upon the meeting of shortages and upon incremental approaches: that is, who are the unemployed, *and how can they be helped* through education and training to become self-supporting? Our Manpower Development and Training Act (MDTA) and our Economic Opportunity (OEO) programs reflect this focus. The approach works quite well in a rapidly expanding economy where there are selective employment shortages for which at least some of the unemployed or disadvantaged can be trained. We might characterize the MDTA-OEO approach as being primarily a "supply push." Of course, we do give some attention to demand shortages in determining training programs.

Yet perhaps we now should begin some contingency planning that goes beyond the "supply push" concept. The first round of training and retraining under ARA, MDTA, the Expanded Vocational Education Act, and the OEO can skim off the cream of the job openings, which can be located fairly directly by surveys of employing establishments. Subsequent rounds of training and retraining, however, will need to consider more precisely the question of what the training is for and will have to make somewhat longer-range estimates of manpower requirements, for two reasons.

(1) On the supply side, the most easily trained and easily employed people, that is, those with higher educational attainment, will have been processed through the program. (2) On the demand side, the conspicuous job shortages will have been filled. Other openings will not reveal themselves without more powerful projection techniques, and thus there is a real danger of undertaking expensive training programs only to create certain occupational surpluses. It is possible that further gains in reaching national employment goals will depend upon more fundamental structural shifts in the economy. Businesses individually are studying such potential shifts, as a means of programing their own corporate investments.

I am pleased to see that the Department of Labor is beginning to publish some of its analyses and projections of manpower requirements. The latest Manpower Report of the President presents some projections of educational attainment, employment, and occupational distributions to 1975.

I believe that more work of this kind, performed by both public and private agencies, will become necessary, particularly as we come to consider the manpower implications of structural changes brought about by technology, changing international trade, and shifting domestic social needs. And in undertaking such manpower analyses we may benefit from work done in less developed countries. They suffer from more austerity in educational capacity, and they are undertaking more deliberate structural shifts—indeed, many of them have to change their economic mix drastically if they are to retain economic viability and independence, and if they are to achieve self-sustaining growth. But even though the efforts of less developed countries in manpower planning are crude and halting and are handicapped by poor data bases, the need for such efforts is becoming crucial. Perhaps by watching the successes and failures of these countries, we can be guided in our own efforts to help individuals and the community become more systematic about choosing effective options in educational and training investments.

DISCUSSION

WILLIAM G. BOWEN
PRINCETON UNIVERSITY

Having just heard two papers by people well informed about problems of less developed countries, you are now about to hear a comment from someone who knows nothing about less developed countries. Having said that, let me now go ahead and make a statement which I hope won't be misinterpreted. The statement is that I'm not sure how much of a handicap my lack of knowledge of less developed countries is, when I attempt to work on rather specific problems in the United States.

I am impressed by Dr. Platt's comments about what we can learn from the experience of the less developed countries with regard to the effects of alternative institutional arrangements. This seems to me to make a good deal of sense. But when we ask ourselves what we can learn from the less developed countries with regard to the application of occupational projections to educational planning, I'm much more reluctant to say that there is a great deal we can learn. I reach this conclusion for three reasons, which I think may be worth spelling out.

First, the main problems which receive attention are vastly different. In the less developed countries, the concern is primarily with bringing about quite rapid structural changes. The allocation of resources between primary, secondary, and higher education, for example, is a critical issue in most of the less developed countries. In this country, on the other hand, rightly or wrongly, this aggregate allocation question is not much discussed.

Secondly, the kind and quality of information available differ appreciably between the less developed and more advanced countries. Those of you who share my personal liking for situations in which it is possible to work with nice, neat, well tabulated numbers ought to appreciate how fortunate we are in the United States; working with the data ordinarily available in less developed countries requires a degree of ingeniousness—and courage—not ordinarily required in this country. Hence, students of manpower problems in the less developed countries have had to make do in ways which really wouldn't be necessary here, even if we were to study analogous problems. Also, much of the work in manpower planning in the less developed countries has used advanced-country benchmarks. Now the United States is, of course, in the enviable situation of not being able to look for "advanced-country benchmarks." The role which ought to be assigned to these benchmarks in the case of these less developed countries is an important question in its own right, and it is a question which I'm not commenting on here. The point I am trying to make is that advanced-country benchmarks constitute a widely used kind of information in the less developed countries which simply doesn't exist as far as the student of manpower planning in the United States is concerned.

The third reason why I have some question about the transferability of knowledge from the less developed countries to our situation is because the policy-making process and the constraints involved are also very, very different. The less developed countries are much more willing and much more able than we are to work at the central-planning level. The federalistic character of the whole decision-making process in this country means that certain sorts of decisions are taken at one level of government, other decisions at another level of government, and so on, with the result that the locus of decision-making power is neither so clearly defined, nor so centralized in this country as in the less developed countries as a group. And here I add a by-the-by comment—namely, that for those of us who don't know a great deal in detail about the vocational education environment or institutional setup in this country, it would be informative to be told at what levels the various allocation decisions are made and over what areas they apply. Unless we know this, it's difficult for those of us who come from the outside to be able to talk very intelligently about what kinds of data are really going to be meaningful.

To return to the main theme of my comment, I feel that the experiences of the other, more advanced countries are likely to be more relevant to our situation. They have tried things, they've generated observations, if you will, which ought to be looked at. Unfortunately, I'm no expert on France, Sweden, Denmark, or, indeed, any of that set of countries, so I simply can't say anything that's going to be at all enlightening, except to suggest that we should be able to profit from their experiences.

I do happen to know something about Britain, since I was there when the Robbins' Committee work was being done. And I can report that one of the greatest debates that occurred in connection with the Robbins' Committee Report was whether or not occupational demand forecasts ought to be used in setting educational capacity targets. I think it would be worth while for those of you interested in this question to read the relevant appendix section of the Report, which was written by Professor Claus Moser. The Robbins' Committee eventually decided not to pay attention to forecasts of manpower needs, but instead to rely on the so-called pool-of-ability approach —that is, to ask how many qualified young people are likely to want higher education.

I suspect that one reason for this decision was that the manpower projections which had been made in Britain at various times during the postwar period were not projections in which the Committee had much confidence, even at a very loose level. Some of our people interested in this area might do well to review systematically the various forecasting efforts which have been made in Britain and to compare them with what happened.

I will make just one other comment on the British experience with manpower projections, and that is that in the late 1950's, when there was a great push being made by university people to get more government money for higher education, manpower forecasts were cited frequently. These forecasts, based on a simple comparison of what company officials said their needs would be with estimates of the future number of university graduates, kept showing that demand would exceed supply and thus were used as evidence of the "rightness" of the position of those who wanted to spend more money on education, in spite of the fact that many of the university people had real doubts about the methodology on which the forecasts were based. A bit later, these same forecasts began to indicate a *surplus* of university graduates in some fields, and advocates of additional spending, for the universities found themselves in a somewhat embarrassing position. I think the moral of the story is clear.

Finally, I want to say just a word about the broad issue of manpower planning. I would associate myself with the comments of those people who spoke earlier about the importance of bearing in mind the flexibility of our economy. A homely example from the university setting may make plain what I have in mind. Universities often budget separately for faculty and for secretaries. I do not advocate having secretaries teach courses, but I do advocate recognizing that there are other areas of work in which substitution is possible; and I cannot dismiss the suspicion that substituting, say, three secretaries for a faculty member might on occasion raise the total output of the enterprise. My greatest disappointment in the work that's been done in this whole manpower-forecasting area is that there's been so little really hard-nosed effort to estimate elasticity of substitution ranges, if not precise figures. To be sure, this is a very difficult problem; but it is so critical, and at the root of so much that we're discussing at this conference, that some effort ought to be devoted to it.

FREDERICK HARBISON
PRINCETON UNIVERSITY

The African countries are faced today with two basic manpower problems. The first is rising unemployment and underemployment, particularly in the urban areas. The second is the shortage of high-level manpower to carry forward national development. I shall discuss only the latter as it is specifically related to university development.

For assessment purposes, high-level manpower is usually divided into two categories:

(1) *The senior category*, persons in occupations normally requiring a university degree *or its equivalent*. In this category we customarily find engineers and scientists, agriculturalists, doctors, veterinarians, graduate teachers, lawyers, diplomats, journalists and writers, and persons in higher managerial and administrative posts in both public and private activity.

(2) *The intermediate category*, persons in occupations normally requiring one to three years of education beyond the school certificate (O-level) or its equivalent. In this category we normally find engineering technicians, agricultural assistants, nurses and medical technicians, laboratory technicians, supervisory and executive personnel, and teachers (for primary and secondary schools).

In African countries, the requirements for high-level manpower have three basic components:

(1) *The requirement for expansion of activities*. This is related to the pattern and rate of economic growth and usually rises and falls with increases or decreases in GNP.

(2) *The requirement to replace expatriates*. This is determined by the number of foreigners in high-level manpower positions and the desired rate of their replacement by Africans.

(3) *The requirement to replace normal attrition*. This is related to life expectancy, retirement, emigration, etc. Normally, it amounts to only two-and-one-half to three percent of existing stock per year.

Based upon a broader article appearing in the *Journal of Modern African Studies*, Vol. III, No. 1 (1965).

In the countries of East and Central Africa (Kenya, Tanganyika, Uganda, Zambia, and Malawi), the requirement to replace expatriates will probably constitute for the next five or ten years over two-thirds of the total high-level manpower requirement. The same is true of Northern Nigeria. In Ghana and in the Southern Regions of Nigeria, however, it may constitute less than one-third of the total requirement, since the process of Africanization is far more advanced.

As a rule of thumb, the rate of net accumulation of high-level manpower for expansion of activities is calculated at 1.5 times the increase in GNP. Thus, if GNP increases by four percent per year, high-level manpower for expansion should increase by about six percent per year.

Another rule of thumb is that the rate of increase in requirements for the intermediate category is greater than for the senior category. In most cases, the stock of persons in the intermediate category should increase twice as fast as GNP. In contrast, the rate of increase of all employed manpower in the modern sectors of African economies is usually less than one-half of the rate of increase in GNP. I should like to emphasize, however, that these rough ratios are used only as target-setting devices and are in no sense accurate forecasts or predictions of manpower requirements.[1]

From the preceding analysis, one can easily see that high-level manpower requirements depend largely on the rate of economic growth and the extent and anticipated rate of Africanization. But there are important exceptions. The requirements for doctors are related to stated social objectives rather than to GNP, and to a considerable extent, the same is true of requirements for teachers. It is also important to remember that the requirement for Africanization may vary by sector. Normally, the government services are the first to be Africanized, followed by private industry and commerce and finally by secondary and higher education. But let us not be concerned at this point with methodological detail. The main point to be stressed is that manpower targets can be set and are increasingly being stressed by planning organizations, and therefore educators should pay attention to them.

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[1] In practice, manpower targets must be expressed in terms of major occupational groups—i.e., engineers, administrators, teachers, agriculturalists, etc. The methodology of occupational target setting is rather complicated and need not concern us here.

From an analysis of available manpower assessments in a number of African countries, one may make the following tentative generalizations.

(1) In terms of numbers, teachers constitute by far the largest requirement in both the senior and intermediate categories. At the very minimum, about one-third of all university graduates should enter the teaching profession, and an equal proportion of those in intermediate post-school certificate institutions should be preparing for teaching as a career. Naturally, these proportions will vary according to the situation in particular countries. In nearly all African countries, however, the requirement for teachers, particularly graduate teachers, tends to be underestimated both by planners and by students in choosing future careers.

(2) For every person in the senior category, about three persons are needed in the intermediate category. Or, to put it differently, in most African countries three persons are required in the various sub-professional categories for every university graduate. Unfortunately, in most countries the output of the intermediate institutions tends to be below-target, while that for university graduates is more likely to be on-target or even in advance of target. Consequently, many African countries are rapidly approaching the point where further university development must be given a lesser priority than expansion of intermediate education.

(3) In the senior category, the most critically needed graduates are: first, agricultural scientists and veterinarians; second, other types of scientists and engineers; third, doctors and dentists; fourth, graduate teachers; and fifth, statisticians and economists. The demand is less critical for graduates in the arts and humanities, law, and other social sciences, although the capacity of African countries to absorb persons with such education is still quite large.

Administrators and managers are also in critical need. But they are not "produced full-blown" by universities. Senior administrative managerial posts are frequently filled by scientists and engineers. In other cases, these top positions are filled by persons with less than university education. In short, managers and administrators are produced in employment, and they come from a wide variety of educational backgrounds. In most African countries, one might expect that between one-half and two-thirds would actually be university graduates.

(4) The time is rapidly approaching when university graduates in the non-technical fields will be unable to enter senior positions upon graduation. The southern regions of Nigeria are now entering this stage. The non-technical graduate who is not inclined to enter the teaching profession must be prepared to accept employment, at least for a time, in intermediate occupations for which he may consider himself to be "overeducated." This situation should be stressed by counselors in secondary schools, and an attempt should be made to channel more secondary school certificate holders into intermediate-level educational institutions.

(5) With respect to teachers, the greatest demand now and for years to come will be for persons competent to instruct in mathematics, agricultural sciences, general science, and technical subjects related to engineering. This means that technical subjects must be given the highest priority in teacher education.

(6) In all categories of high-level manpower, the building of competence is as much related to employment-connected training as to pre-employment education. Institutes of public administration are needed to upgrade members of the civil service. Advanced management training programs are needed to improve the administrative and managerial ranks of private enterprises. Teachers need refresher courses and seminars on new educational technologies. Technicians as well as engineers and scientists must continuously study to keep up to date in their respective fields. And hundreds of thousands of adults can benefit from basic education and literacy programs. Indeed, education planners sometimes forget that the highest immediate returns in human resource development are won by improving the performance of persons who are already employed. And in the long run, continuing education and training is essential for the building of a highly productive labor force.

(7) There is mounting awareness in the African countries of the need for research institutes, particularly in agriculture,

animal husbandry, marketing and distribution processes, as well as in new technologies of education. Such institutes are quite large users of high-level manpower, particularly scientific personnel with postgraduate training. And the application of research findings requires very large numbers of extension workers, particularly those with training at the intermediate level.

(8) Finally, as African countries travel the road toward industrialism, the private sector tends to increase its employment of high-level manpower, whereas the jobs available in government tend relatively to decline. In Nigeria, for example, the public authorities now employ about 60 percent of the country's high-level manpower. In ten years' time, however, the private sector is expected to increase its share from the present 40 percent to well over 50 percent of the total. (The shift is even more pronounced if we exclude from government its largest and most rapidly growing sector—education.) The institutions of higher education should take this shift into consideration in designing their curricula and orienting their students. The notion that the primary function of a university is to produce senior civil servants is already obsolete for modern African nations.

The eight generalizations just presented are indeed subject to modification in particular countries. And in some, other trends in requirements will be identified as more sophisticated manpower assessments are made. But, let us take these eight at least as plausible assumptions and proceed now to look at some of the critical areas of choice in the development of African higher education.

SOME CRITICAL CHOICES

The Allocation of Educational Opportunities

In Africa the opportunities to acquire higher education are scarce, and the rewards to those who complete it are great. The educated African enjoys high pay and prestige and occupies the major command posts in his country. But his nation and his fellow Africans make large sacrifices for his education. As President Nyerere of Tanganyika said to Parliament when introducing the Development Plan to his people,

> ...Some of our citizens will have large amounts of money spent on their education, while others have none. Those who receive the priviledge therefore have a duty to repay the sacrifices which others have made. They are like the man who has been given all the food available in a starving village in order that he may have strength to bring supplies back from a distant place. If he takes this food and does not bring help to his brothers, he is a traitor. Similarly, if any of the young men and women who are given education by the people of this Republic adopt attitudes of superiority, or fail to use their knowledge to help the development of this country, then they are betraying our union.[2]

Most Africans must be supported in universities at government expense. Thus, the government in effect allocates opportunities for higher education. The question then arises: what criteria shall govern the selection of those to be supported? Scholarships and bursaries may be allocated on the basis of *intellectual capacity* as measured by aptitude tests, and school performance; on the basis of the *country's manpower needs*, with preference for those wishing to enter critical occupations; on the basis of *regional, tribal, and political considerations*; or on the basis of various combinations of the above. In making the proper choices, governments must strike a delicate balance between the interests and desires of the individual and the needs of the state for national development.

Until very recently, little systematic attention was given to manpower needs. But as countries progress with manpower assessments and the establishment of national manpower boards, greater emphasis will be placed on this factor. Indeed, Tanganyika has already started a program of allocating bursaries for university study, both at home and abroad, on the basis of manpower requirements.

There are also important choices to be made regarding the aggregate amounts to be allocated to support of students in universities vs. support for those in intermediate educational institutions. Here again, because relatively few Africans have the means to support their own education, governments which appropriate and allocate support will have far-flung influence on the composition of the student population and hence the long-run pattern of development of African higher education.

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[2] From address by President Mwalimu Julius K. Nyerere to Parliament, May 12, 1964.

Opportunities for Study Abroad Provided by Foreign Donors

Many foreign governments provide opportunities for Africans to study abroad. Indeed, in some African countries the number of fellowships for foreign study provided by external donors exceeds those provided by the home government. Here several difficult policy issues arise. Should students be free to accept offers for study abroad without the approval of their home governments, or should they be required to have prior consent from their governments? If prior consent is to be required, by what criteria should permission to study abroad be given: unavailability of particular kinds of training in the home country, duration of required period of study abroad, political or tribal considerations, effect upon alignment or non-alignment with foreign powers, or expressed desires and aptitude of individuals? Is it appropriate or possible for the African governments to tell foreign donors what kinds of offers of educational opportunities will be accepted or rejected?

In practice, African governments have had little control over foreign offers for study abroad. For the most part, they have benefited from foreign assistance in this area. But in some cases their best students have been lured abroad, making it difficult for the local institutions to attract the best talent. And in other cases, it has been difficult to get students who go abroad to come back in reasonable time to their home countries. In any case, an African government which attempts to build a rational policy for allocation of its own educational opportunities will inevitably have to build as well a coordinated strategy for accepting or rejecting offers for study abroad by foreign countries. Here they will encounter strong personal and political pressures. But the choices which are made will have a vital bearing on the building of African universities.

The Concept of the Role of the University

The most basic choices in building African higher education lie in the role to be played by the universities in national development. At one extreme, the universities may play a very narrow role, limiting themselves to university-level education at high standard, to pre-employment rather than continuing education, and to basic research. Or, they may extend their sphere of influence downward and outward to encompass intermediate education, applied research, extension services, and adult education.

I have already mentioned that in most African countries three persons need intermediate education for every one who has a university degree. I have also referred to the need for research institutes and for various programs of continuing training for those who are already employed. In this connection, let us look at some very important but thorny questions. Should higher teacher education be the responsibility of special institutes or the universities? Should educational research be conducted primarily by institutes or by the universities? Should the ministries of agriculture be responsible for agricultural research, or should the universities assume the major role in this field? Should universities engage in agricultural extension (as they do in many advanced countries), or is this a function of government? Should the technological institutes be separate from the universities (and indeed be tempted to raise themselves to university status), or should they be associated in some organic way with the universities? Do the universities have a role to play in public administration and advanced management training, or are such activities best left to specialized institutes? Will the universities through social science research organizations play a leading role in the actual building of strategies of national development, or will they stand aside and let government ministries do the job?

If the universities choose to play a narrow role, they must also be resigned to limited financial appropriations. Although the provision of university education is vitally important, the development of intermediate education and applied research must now be given higher priority in most African countries. On the other hand, if the universities play too broad a role, their energies may be so scattered as to prevent operation at high quality in any field. Universities may choose to be on the periphery or in the center of national development. The nature and extent of their involvement present choices which are indeed difficult to make.

Economic vs. Sectional Factors in University Development

Universities are very expensive institutions, and small universities with many faculties are economically wasteful, since they cannot benefit from economies of scale. The cost of university development in Africa could be reduced by inter-region and inter-nation integration of university faculties. However, national, regional, and political considerations are often as important as economic factors in determining where universities shall be located and what faculties they shall develop. The complexities involved in making choices here are, of course, obvious to all of those present and need no further elaboration. Nevertheless, growing economic stringencies with consequent shortage of funds for new university development are likely to force hard choices upon African nations in the near future. Realistic educational planners, therefore, cannot escape careful consideration of the issues involved.

ARNOLD NEMORE
DEPARTMENT OF LABOR

I am very much in agreement with what Bill Bowen had to say, except possibly for one point: his agreement with Professor Platt about how much we could learn from the actions of certain institutions in underdeveloped areas. I would think this is an over-simplification, because in education, educational planning, and labor markets, in general, the name does not describe an institution, but a set of relationships. Take the name employment service: it describes a series of relationships which exist in different communities and at different levels of a society. Thus, when one says that in a certain country there is no employment service, he is usually saying that the formal structure is missing. However, to say that there is no employment service does not mean that the relevant relationships do not exist. Therefore, it is much more difficult to transfer the lessons than I think one might imagine at first glance.

I think we could learn most from the undeveloped countries in the area of projections by experimenting with techniques of projection in a less complex society. Here we could more easily isolate variables than we are able to do in more complicated situations.

Now let me turn to the question of educational planning as we have discussed it at this conference. It seems to me that, in talking about educational planning, we have been talking about three separable things. First, we have spent a good deal of time on curriculum planning. Next, we have discussed the question of numbers, that is, how many do we train for what kind of things. Finally, we have the problem of guidance and counseling. For each of these three areas I would like to look at the implications for occupational data.

Before getting to this, however, I would like to say that in the United States we probably have better data than that available anywhere else. The projection techniques which we have in this country are the most sophisticated available. I think the people working on them will continue to work on them and will continue to improve them. In spite of this situation, I think that for a number of problem areas and for some time to come we will have inadequate occupational data. If this is true, what are the implications for these problem areas. How can we operate in each of these areas with inadequate occupational data?

In the area of curriculum planning, I find myself at a loss to really understand why we need very much more occupational data than we now have. It seems to me that we can package this data in better ways. In my own limited experience, the most serious disadvantage of occupational data in this country is that it is not well packaged and distributed. In spite of this, curriculum planning today is much more limited by the institutional rigidities of educational institutions and particularly of the vocational education system than by data programs.

Now let me skip to the last area, that of counseling and guidance. In the last few months, I have had the opportunity to meet with a number of state counseling groups. This has exposed me to the kinds of people doing counseling in a number of places. When they let their hair down, they complain about their lack of knowledge of what is going on in the world about which they must advise. It is not that they don't get the occupational data; they do—and although they have some complaints about it, they find it helpful. Most of the people, even in the smaller school districts, received this kind of data. The kind of thing which they lack, and which I think is much more serious, is contact on a continual basis with the world of work about which they are advising people. So when somebody asks a counselor what research in science is all about, he is not in a very good position to tell him. Thus, occupational data could be better packaged and it could be gotten to more teachers—I think steps are being taken in this direction. However, almost nothing is being done to develop institutional arrangements whereby counseling and guidance people will have exposure on a continuing basis with the world about which they're counseling.

Finally, the last and the most difficult area is the area of the numbers. I find that I have the same dilemma as Joe Joseph. We have a decentralized decision-making system in which various people respond in various ways to whatever information they have. There is no central planning or central control. In spite of bad results, and sometimes there are bad results, I would be unwilling to give up this kind of decision-making system. Therefore, the question is: does the data really address itself to the important questions in this area? I think the basic question is what gives people flexibility. I find it difficult to believe that, if economics were abolished tomorrow, anyone sitting around this table would have difficulty finding a job in some other area. It reminds me of a story of the mastoid surgeon back in the late 'thirties who had one of the most lucrative practices in the East. Then came the rapid development of sulfa drugs and penicillin. With their use, mastoid infections were pretty much prevented or easily cured, obviating the need for mastoid surgery. The doctor had plenty of money, but he wasn't willing to give up and just sit back and spend his money. He was able, because of his background, to go back to the hospital for an additional year of residency. Then he was back in the medical market again. This time he was daring people to make his skill obsolete—he had become an obstetrician. This makes an important point; although an individual can become highly specialized, if he has a rather broad background, with a minimum of retraining or refurbishing he can be back in the market and doing well.

After covering these three areas, I find it difficult to understand why we feel occupational data is a serious limiting factor in educational planning and why we have concentrated on it. The people who are involved in preparing occupational data will continue to do so and will improve their material. They will also attempt to package it in better ways. However, I think we would find a much higher payoff if we concentrated both our time and our money, in terms of experimentation and demonstration, on the problem of institutional barriers to effective educational planning, something with which people have not yet begun to work and are most unwilling to work.

HERBERT S. PARNES
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There are striking similarities between the two papers we have just heard. Both focus primarily on what has come to be known as the "manpower approach" to educational planning. Both in the Mediterranean countries, whose experience Mr. Kelley describes, and in the countries from which Mr. Platt draws his examples, the principal criteria for planning educational investments have been the anticipated needs of the economy for trained manpower derived from the over-all economic development plan; both authors outline essentially the same procedures for translating development targets into requirements for outputs of the various levels and branches of the educational system; both acknowledge that educational targets have been expressed largely in quantitative terms, i.e., numbers of persons with specified levels of schooling of various types; both recognize the difficulties that stem from limitations of data and from the technical problems of forecasting occupational structure and converting occupational into educational categories; both concede the necessity of "adding in" the requirements for education that stem from non-vocational considerations—"cultural" requirements in Mr. Kelley's lexicon, and "social and political demand" in Mr. Platt's—although neither is as explicit in indicating how this can be done as he is in describing how manpower considerations are taken into account. Finally, while both authors purport only to describe, there is clearly an element of advocacy in the presentation of each.

The widespread and growing use of the procedures for educational planning described in these papers makes a careful evaluation of them imperative. I feel some embarrassment in making such an assessment, for, like Kelley and Platt, I have both described and used these procedures, and I share with them the conviction that manpower considerations must be taken into account in any rational system of educational planning. Nevertheless, I confess to moments of gnawing doubt, if not downright panic, about the ways in which the so-called "manpower approach" to educational planning is sometimes used. Being in an essentially friendly environment, I should like to reverse my usual role of defining the approach and raise some troublesome questions about. In doing so, I hope it will be clear that I do not intend these remarks to be critical of the two papers that have been presented, for I am certain that both Mr. Platt and Mr. Kelley are as aware as I am of the dangers that I shall mention. Indeed, most of them are explicitly acknowledged in Kelley's paper.

The problems that bother me are both conceptual and technical, but the former seem more significant. The first of these has to do with the relationship between education and economic development. That education of the proper type can make a contribution to development—indeed, that it can be indispensable to it—is hardly debatable. The important question, however, is *how* education contributes to economic development and growth. *A priori*, there are three related, but analytically distinct, ways in which education may be necessary to or may stimulate development: (1) by providing the labor force with the kinds and levels of vocational competence that preconceived development goals require; (2) by equipping the labor force with the characteristics that will be conducive to innovation and increased productivity; and (3) by creating a general cultural milieu that will permit and encourage economic and social development. In the first of these cases, education is in a sense the dependent variable, which must respond to planned changes in the structure of the economy. In the second and third cases, on the other hand, education is conceived as the stimulator of change. Both of the first two are related to vocational preparation, the first more clearly than the second; but the third is completely unrelated to vocational considerations, having to do with the general level of enlightenment of all of the members of the society.

The approach to educational planning that has been described in the two papers focuses explicitly on the first of these three relationships between education and development, but very little on the second and not at all on the third. The latter define the "cultural" or the "political and social" requirements for education that are to be "added in," in ways that are not clearly specified. In the absence of certain knowledge of the relative strengths of the several relationships between education and development, it is difficult to be completely confident of the priorities that are implied by this procedure.

It is even more difficult to accept the notion that education's role in vocational preparation is economic, while its other roles are "social and political." I should prefer to distinguish between vocational and non-vocational implications of education, recognizing that many of the latter may have great significance for economic development and growth. This is more than a semantic quibble, because terminology does influence as well as reflect thought, and those who practice the "manpower approach" need constant reminders that education contributes to economic development in ways other than through vocational preparation, not to mention the *truly* noneconomic importance of education.

A second characteristic of the educational planning that has been based primarily on the manpower approach has been its relative neglect of qualitative factors. Whatever the instrumental purposes of education—to use Mr. Kelley's term—it is clear that educational requirements cannot be specified only in terms of the numbers of students for whom seats need to be provided in the various branches of the educational system. As John Vaizey has pointed out, education can retard as well as promote economic development, depending on its nature.[1] In many cases, it is likely that improvements in the quality of education would make more substantial contributions to development than expansion of enrollments, yet this is a matter that has tended to be slighted.

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[1] John Vaizey, "The Role of Education in Economic Development" in H. S. Parnes (ed.) *Planning Education for Economic and Social Development* (Paris: O.E.C.D., 1962), p. 41.

Accepting for a moment the single purpose that the manpower approach purports to serve—viz., ascertaining the required numbers of graduates from the several levels and branches of the educational system—there are nevertheless several disquieting aspects of the method. As both Kelley and Platt point out, manpower requirements are ordinarily derived from the development plan—or, more accurately, from a temporal extension of the plan, since development plans ordinarily do not cover sufficiently long time periods. In his schematic diagram, Platt also indicates a "feedback" from the calculated educational requirements to the development plan itself, recognizing the necessity of altering the production targets of the plan if their manpower and educational implications appear not to be feasible. But is this sufficient if the development plan purports to indicate the optimum means of achieving a given level and composition of output? Logically, ought not the educational implications of alternative technologies be considered in the process of drawing up the initial economic plan? I am not prepared to suggest a method for the simultaneous determination of both these elements, but I confess to a certain uneasiness about its absence.

Once the target output and productivity levels of the plan are accepted as given, there is still the problem of estimating the future manpower structure that these targets require. Although this is not an insignificant problem, I agree with Professor Kelley that it is reasonable to assume relatively fixed production coefficients, when both level of output and labor productivity for a given branch of economic activity are given. However, I also agree with him that additional research on this question is called for.

Both papers emphasize the difficulties of converting occupational into educational requirements, and this is an area that also deserves more research. I would be inclined to give somewhat less emphasis than Platt does to *prevailing* relationships between occupation and educational attainment, and somewhat greater emphasis to exploring *optimal* relationships between them. The work that Eckaus has done[2] represents one approach to this question; another would be studies of the relation between various levels and patterns of education and quality of job performance in specific occupational categories.

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[2] R. S. Eckaus, "On the Comparison of Human Capital and Physical Capital,"

Let me conclude with a few observations about the possible relevance for the United States of the kind of educational planning described in these papers. There are at least two factors that would make it easier to apply the manpower approach in the United States than in countries like those of the Mediterranean area. One is the greater abundance of relevant data. Information on employment and unemployment, occupational structure by industry, educational attainment by occupation, etc., is more highly developed here than anywhere else in the world and is incomparably better than that found in the countries referred to in the papers under consideration. Also, there are more numerous and better qualified manpower technicians for carrying on such planning.

On the other hand, the factors militating against such planning in this country are more significant. First, from a purely technical point of view, long-term projections of occupational structure are an even more formidable task in a country that takes the lead in technological innovation than in one that can be presumed, at least to some extent, to follow the course of technological change that has occurred elsewhere. But more important are the institutional factors that make the situation quite different for the United States than for countries like Turkey and Greece. The absence in the United States of a commitment to planning and of an over-all planning mechanism and the fact that the educational system in this country is highly decentralized are relevant in this connection. The much higher level of educational development in the United States also means that educational requirements are more likely to be calculated in terms of demographic trends and the "social demand" for education than in terms of manpower needs. The differences that Kelley has described between educational planning in the MRP and the EIP countries are not accidental. They stem from some of the same differ-

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in Selma Mushkin (ed.), *The Economics of Higher Education* (Washington: Government Printing Office, 1962).

ences as are noted here between the Mediterranean countries and the United States.

But this does not mean that there is no need for this type of manpower and educational planning in the United States, and I share Platt's enthusiasm for the kind of manpower and training planning that are implicit in the Manpower Development and Training Act. It should be recognized, however, that the possibilities he alludes to at the conclusion of his paper will require much more detailed—and therefore more difficult—occupational forecasts than those that have generally been made for purposes of broad educational planning.

H. EDWIN YOUNG
THE UNIVERSITY OF MAINE

I enjoyed reading these two papers; I think that the writers did very well indeed at trying to do what the people who organized this hoped that they would do. But I want to talk about my own views.

I think the ability to predict specific needs in a developing country are much more difficult than in our own. The developing nations are changing very rapidly indeed; the statistics are inadequate, and one can waste a great deal of time (and a great deal of time has been wasted) with compiling statistics, making plans in the central planning agency which are not carried out for political, cultural, or institutional reasons. I would suggest that anyone anywhere who wants to plan education try to plan the possible, taking to account what can come about, the changes in government, the changes in planners, the changes in foreign advisers, etc., and look at fairly basic things. In the very short run, the plan has to have people to perform, or help perform, tasks. These people are recruited from abroad and rapidly trained from whatever supply exists, and the census of the supply of people with skills is very useful indeed. Second, in the secondary schools or the technical schools, again one must devise curriculum to build on whatever the existing primary education system has. The raw materials go in, and one must work with them and adapt to them. To follow the advice of several people here, use the market to induce people to go into these activities. I use the market a little differently, perhaps; I think of the market as paying the teachers more where you want them. Use the market to direct the skills of the teachers and also to make available the particular kind of vocational or technical schools or whatever the planners know is going to be needed in the very near future. It's difficult to overestimate the usefulness of people who have some fairly basic technical skills. Those of us who've worked with retraining know that its most important ingredient is having been trained before, that is, having some basic notions about work, how to go about things, the ability to read blueprints, to read anything, for that matter. These can be juggled.

Turning to longer-run planning, I'm working on the assumption that in most countries there will be a very heavy drive for universal literacy and universal education. That force is there, and nothing that the planners can do will stop it; the thing for them to try to do is to shape it. Here, it is not the occupations that should shape it, but some analysis of the building blocks in education: what are the things that are common to a great many occupations that any country will need, no matter what happens? We again come back, it seems to me, to the very sound, basic education of reading, writing, arithmetic, and, I hope, someone will devise some kind of subject matter, training matter, that will induce people to develop some of the skills with their hands and with the initiative that we ascribe to that very select group of Americans who grew up on farms and worked with all kinds of machinery and all kinds of equipment. The thing that impresses so many people who go to underdeveloped countries is that the children have no toys, they have no manipulative skills; perhaps we ought to look at this too as part of a curriculum.

But I think we ought to look at a curriculum from the point of view of the very basic features that, ten years from now, people can build on, as the needs of the countries change. My primary concern in building the curriculum would be one that would help identify, throughout the population, those people who have the aptitudes for science, mathematics, and the things that are going to be needed in the modern world.

This is the problem in most of the countries. In Indonesia we worked out plans for bringing a number of people to this country for training in statistics. From what we discovered, there weren't enough people in the whole country with mathematical training for us to be sure that we'd have an inflow of enough fellows and enough students to go back and teach. The millions who'd been taught in primary schools had avoided mathematics—they'd learned to read a little. A very important thing is to have a bias towards finding these people. Another thing we need to do operationally is to have the anthropologists look at cultural settings, and tell us how, against the cultural setting, to identify people with a potential, people that we want to nurse along throughout the system.

Finally, I would say that it is important to use the market place to make sure that as many people as can be afforded, from the higher levels and needs, stay in regional centers and not flock to two or three centers. One of the greatest problems of India now, if one is trying to work in the rural areas, is to find any Indian with an education willing to go back to the village and stay there. Find some market devices to make this successful. Well, these are some truisms.

One thing that no one has mentioned, though I would hope that somebody would do some research on it, is the relationship between the military and vocational and technical training. In some countries, it seems to me, there is great value in using the training given by the military, for whatever it's worth; perhaps one of the ways to have a new tack on the technical side is to get the military to broaden its training.

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PART IV

EVALUATION OF OCCUPATIONAL DATA AND THEIR USE IN OCCUPATION PLANNING

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EVALUATION OF OCCUPATIONAL DATA AND THEIR USE IN OCCUPATION PLANNING

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The need for occupational projections is obvious—apart from filling man's urge to gaze into crystal balls to divine the future. Beyond idle or intellectual curiosity, there are practical considerations that explain the quest for insight into likely future occupational distribution.

Occupational and geographic changes and mobility have characterized the American employment scene in the past. All available economic indicators suggest that occupational changes will be no less profound during the decade ahead and beyond. To the extent that occupational projections can help in vocational guidance of youth and in planning by educational authorities and various other decision-makers to implement programs for the years ahead, they can lighten adjustment burdens and usefully smooth the desired matching of the economy's occupational requirements and its manpower supply.

Data on anticipated demand for future occupational patterns are increasingly being developed by diverse government and private sources. Current apprehension about decline in demand for total labor and concern about shifts in needs for specific skills have stimulated interest in projecting future requirements for labor.

BROAD OCCUPATIONAL PROJECTIONS

The Bureau of Labor Statistics (BLS) prepares the most widely used national occupational projections. These are based largely upon industry employment projections, which in turn are based upon estimates of total labor force and gross national product. Thus, the latest occupational projections for 1975 are based on extrapolations of past changes, modified by educated guesses and careful analysis of likely future trends. In making the occupational projections for the decade ahead, BLS has considered the impact of anticipated technological changes, research and development activities, structure of business organizations, and other factors that may affect the occupational composition of American employment, including social factors such as changes in rural-urban mix, education, and labor force participation rates. In addition to detailed technical projections of specific occupations, the BLS publishes projections for nine industry groups, *e.g.*, manufacturing, agriculture, government; and for nine broad occupational groups, *e.g.*, service workers, clerical workers, skilled workers.

These projections are at best an appropriate indication of occupational demands a decade hence and are subject to continuing revision. No claims are made, least of all by the technicians of BLS who prepare these data, for the accuracy of the projections. Certain basic assumptions have to be made in developing the projections: full employment conditions in 1975, a continuation of the present international situation, and a continuation of the current magnitude of national defense expenditures over the coming decade. Obviously, any radical change in our international commitments would have an impact upon the occupational demand for labor.

The National Planning Association has already used existing Department of Labor data to project employment by industry in greater detail than that published by the government agency. It has also projected changes in employment by region over the next two decades. But these projections are largely extrapolations of past trends. The Battelle Memorial Institute has refined the linear extrapolation technique in projecting future patterns of occupational demand by taking into account the impact of the rising level of educational attainment and income.

Occupational projections may be of limited help to the individual planning a career or to the school counselor in guiding individual students to prepare for future employment. This is particularly so if the projections are only in terms of the broadest occupational categories. The anticipation that employment in the professions will increase by about a third during the coming decade doesn't effectively guide a student considering a choice between a career in pharmacy, where employment opportunities are likely to grow only slightly, and various fields of chemistry where jobs will expand rapidly. Similarly, the knowledge that employment in clerical occupations will increase more than the average may not adequately guide a youngster wondering if he should train for work in card punching. Whether the above observations are germane to the functions of the educational system is debatable. Some would insist that the role of the school is to provide a broad educational background, equipping individuals to shift to related fields of work, and not to train students for narrow occupations.

While broad occupational projections are of little use to the individual, they may serve an important role in over-all policy formulation and education planning. The increasing demand expected for professional and related skills and the rising demand for administrators and managers with a college education have been sufficiently persuasive with public and private decision makers to lead to the allocation of additional resources for higher and technical education. The most persuasive argument for the National Defense Education Act of 1958, including later expansion of this legislation, and the Higher Education Facilities Act of 1963 has been rooted in the widely accepted projection that the demand for professional and technical skills will continue to rise and that a growing and expanding economy will require a larger supply of persons with these skills.

Similarly, broad industry and occupational projections have played an important role in the overhauling and increasing of federal aid for vocational education. The continued shrinking of agricultural employment opportunities, and the anticipation that only one out of every ten youths now living on farms can look forward to full-time employment in agriculture a decade hence, has convinced Congress—admittedly several decades late—of the need to de-emphasize federal aid for vocational training in farming occupations and to expand substantially the assistance for technical, clerical, and other occupations which are likely to expand in the future.

The desirability of obtaining more detailed occupational projections had received official federal sanction in the Vocational Education Act of 1963. The Act requires state vocational boards, in cooperation with public employment service, to make available "occupational information regarding reasonable prospects of employment in the community and elsewhere..." [Section 5(a)(4)]. In response to this mandate and to fill other needs, the Bureau is now planning to expand and refine its occupational projections to make available estimates of future occupational demand in greater detail, including current and projected occupational patterns by industry and training needs for important individual occupations. These data in turn will be used by the United States Employment Service and affiliated state agencies as a framework and guide for the preparation of occupational projections for each of the 150 major labor market areas.

OCCUPATIONAL OUTLOOK

The most useful occupational information from the vantage point of the youngster planning a career or his counselor is presented in the *Occupational Outlook Handbook*. This type of occupational material was originally recommended in 1938 by President Roosevelt's Advisory Committee on Education. First published in 1949, listing 108 occupations, the volume has been re-issued biannually since 1957, and its coverage has been broadened. The fifth edition was published in 1963 and included information on over 600 occupations and 30 major industries. The *Handbook* is supplemented by the *Occupational Outlook Quarterly*, which updates the biannual publication and focuses on other information of interest to counselors.

The popularity of the *Handbook* is attested to by the fact that, next to pamphlets on the rearing of infants, it is the most popular publication of the Government Printing Office—even though it sells for $4.75. More than 50,000 copies of the 1963 *Handbook* have already been distributed, mostly to school guidance counselors. In addition, the Government Printing Office has reprinted about a million copies of individual sections of the *Handbook*.

For each of the listed occupations, the *Handbook* presents the amount and type of training necessary to prepare for the occupation, the anticipated range of annual earnings, the industries which employ persons trained in the work, and the anticipated trend of employment. The *Handbook* does not quantify its projections, but classifies in five categories anticipated employment trends: (1) no growth or decline, (2) slow growth, (3) average growth, (4) above average growth, and (5) rapid growth.

The lack of quantification detracts little from the usefulness of the projections. Absolute quantities of anticipated change might be of little use to a counselor or individual student in forming judgments about the chances of gaining employment in a given occupation.

The occupational projections are based on anticipated trends in specific occupations and/or occupational composition patterns in any given industry. Some projections of occupations are not related specifically to forecasts of general economic trends or to anticipated industry trends, but are affected to a greater degree by other factors. For example, forecasts of demand for elementary and secondary school teachers can be made on the basis of anticipated population aged six to eighteen, most of whom had been born by the time the projections were made. Since the student-teacher ratio in elementary and secondary schools has remained relatively constant in recent years, and since state laws require school attendance at least until age 16, projections of demand for teachers might appear to be a relatively simple exercise. However, forecasting is always hazardous. The passage of the Economic Opportunity Act in 1964 and the Education Act of 1965 may throw out of line the relatively "safe" forecasts of teacher demand. Should the appropriate federal agencies place greater emphasis upon providing nursery and kindergarten facilities to pre-school children from poverty-stricken families, then the demand for remedial and other specialized teachers will increase beyond the expectation of the projections made before passage of the above legislation.

The projections of manpower requirements in most occupations are subject to even greater hazards. How many automobile mechanics will we need five or ten years hence? In this case, the technician must estimate the number of automobiles that will be in use, and this estimate depends, in turn, upon changes in GNP, the extent of employment and unemployment, mobility of population in suburbia, changes in automotive technology, and many other factors.

Some occupations are industry-oriented, and here the projections are based upon anticipated trends in production and employment in the industry, changes in output per unit of labor, and the composition of the labor mix in the industry. Thus, the number of engineers that will work on railroads ten years later can be anticipated once appropriate assumptions have been made about changes in technology, the share that railroads will retain of total transportation services, and, of course, the trend of the economy during the decade ahead.

In practice, the projectors do not rely upon sophisticated and complicated assumptions for each industry. Projections for employment in any given occupation are largely extrapolations based on past developments, though seasoned with some measure of educated guesswork about major changes in process or in prospect. In most cases, extrapolations, plus educated modifications, are adequate to predict trends in employment over a period of a decade, but hazards persist. In the railroad industry, the employment of engineers a decade hence may not depart too far from the projections. However, the collective bargaining agreement, arrived at by arbitration, providing for the eventual attrition of most firemen, is an event which the occupational specialists could not prognosticate. Still, since these specialists do not quantify changes in employment, but just indicate short- and long-run trends, they are likely to prove correct about the anticipated decline of railroad firemen.

The projection of occupational employment in railroads, a declining industry, may be relatively easy compared with projection of employment in truck driving. The bulk of locomotive engineers are employed in the railroad industry; truck drivers are found in practically every industry. Here the projections become much more complicated and require forecasts of employment in all industries which employ truck drivers and a guess as to the proportion of truck drivers that will be employed in each industry.

Despite the great difficulties encountered in making surefire projections, the technicians in the Bureau of Labor Statistics can boast of a reasonably good record. Occupational projections can be verified every decade from data obtained in the Decennial Census of Population. While the latter is subject to many technical shortcomings, it still presents an actual nose count. Thus far, only the projections made in the first *Occupational Outlook Handbook*, published in 1949, can be compared with the results obtained from the 1960 Census.

As stated earlier, the 1949 *Handbook* made projections for 108 occupations, and in 99 cases the projections predicted the actual trend in change of employment, though in 42 of the 99 cases the forecasts were somewhat off the mark. For example, a forecast may have anticipated average growth in a given occupation (15 to 25 percent), but the actual growth may have been rapid (above 40 percent) or slow (0 to 15 percent). In nine of the 108 occupational forecasts, the projections proved wrong: that is, where the projections indicated a rise in employment there was actually a decline, or the reverse. Critics have questioned, however, whether the record of the first *Occupational Outlook Handbook* is as satisfactory as it appears on the surface. They suggest that the broad projections made in the *Outlook* preclude the probability of missing the mark too frequently.

In evaluating the initial occupational projections, Harold Goldstein, Assistant Commissioner for Manpower, Bureau of Labor Statistics, indicated over-all satisfaction with the maiden effort, but expressed some difficulties inherent in projections made by a government agency. "There appears to be a tendency toward caution, which is to be expected when a government agency issues projections—caution in anticipating extreme changes, caution in anticipating changes in direction from past trends, and caution in pinpointing declining employment when the evidence is less than overwhelming."[1]

The majority of state employment services also publish occupational projections. These state efforts vary widely in scope and coverage. California's *Occupational Guide* is the most comprehensive and includes information on 356 occupa-

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1. Harold Goldstein, "An Evaluation of Experience in Long-Term Projections of Employment by Occupation," presented before the 21st Interstate Conference on Labor Statistics, San Franciscok California, June 27, 1963 (mimeographed).

tions. The *Guide* series, modeled after the federal *Occupational Outlook*, presents both state and local information of job prospects in the covered occupations. Each occupational guide is reviewed every three years and is distributed widely throughout the state.

AREA SKILL SURVEYS

Current BLS projections are national in scope. However, most educational planning is on a state and local basis. Georgia's effort in this area is an illustration of the eight statewide occupational projections prepared during the past three years.[2] The Georgia survey had a triple objective: (1) determining future demand in 155 technical, skilled, and clerical occupations; (2) measuring the adequacy of company and public educational institutions' training programs to supply anticipated skill needs; and (3) formulating policy recommendations.

The projections were based on a sample mail survey of a cross-section of Georgia's employers and interviews with top management of 80 large companies located in the state. From the data obtained, it was concluded that private companies will train 25 percent of the total to be needed for skilled occupations, and public institutions will train another 50 percent, thus leaving a deficit of trained skilled personnel amounting to one-fourth of the total projected need by 1967. The conclusion was inescapable that, unless there was a sudden, unanticipated, marked upturn in industry training efforts, training by public education institutions would have to be expanded if the state's requirements for technical, skilled, and clerical workers are to be met. In 1964, a year after the study was published, the Georgia Legislature allocated an additional $71 million for state colleges and universities and $55 million for secondary education improvements. New tax measures were also enacted to increase support of the public education system.

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[2] Georgia Department of Labor, Employment Security Agency, *Georgia Skill Studies Summary Report* (1963).

Most state employment services, in cooperation with local offices, have prepared Area Skill Surveys, providing information on current employment by occupation and projecting labor market skill needs for two to five years. To date, nearly 150 skill surveys have been prepared, mostly during the past three years. Normally, Area Skill Surveys focus upon occupations requiring a year or more of preparation in semi-professional, technical, skilled, and semi-skilled groups. The projections are based on data supplied by employers and are therefore subject to serious drawbacks. Few companies make detailed projections of manpower requirements, and the information supplied by the employers is only too frequently prepared by officials with limited information about their company's prospects. Since the surveys are based on employer responses, the projections do not include data on skill needs of companies not in existence or not in the area when the surveys are made.

Some of the local skill surveys are based on rigid assumptions and are therefore of doubtful value in appraising future occupational needs. For example, a Philadelphia survey came up with the startling conclusion that by 1967 the city will have a shortage of 4,000 policemen, firemen, and watchmen and a surplus of 2,400 barbers and beauty operators. The survey recognized that "this is the situation as it appears on the surface." The projections were based on available training facilities and anticipated attritions, and no adjustments were made for geographic or occupational mobility and the likelihood that a surplus of available skilled personnel will discourage additional training.[3]

A study which attempted to verify employment projections made in the Chicago labor market cast serious doubt on the reliability of the data obtained from employers. The study concluded:

> Those preparing the anticipations seem to have little knowledge either of future operating schedules of the company or of forecasting techniques. The methods used are invari-

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[3] Commonwealth of Pennsylvania, Bureau of Employment Security. *Manpower Skill Requirements and Training Needs: Philadelphia Labor Market Area 1962-1967* (November 1962, mimeographed).

> ably rudimentary and often rely heavily on personal evaluations. . .
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> Derivation of the anticipations is frequently regarded as a marginal undertaking for the firm. They are more often felt to be of service to the government or to industry. In the great majority of firms, they play no role in planning or policy formation.[4]

It is not at all clear, however, that the technical shortcomings of Area Skill Surveys present serious impediments to formulators of educational policy. Knowledge of general trends should be adequate to plan for the expansion of needed facilities and programs and retrenchment in others. The details as to specific courses can be implemented on a case-by-case basis and should normally require a short lead time. The fact that area skill projections have no way of taking into account the demand of new employers starting business after a survey is completed should not constitute a serious obstacle to educational planning. It might be taken for granted that any new major employer in an area would consult with school authorities or the public employment service about his anticipated skill needs, or that the news would become sufficiently widespread within the community and available to the school authorities, even if a prospective major employer failed to advise the school authorities of his plans. The school authorities could then revise their planning in line with new developments. However, in practice, it would appear that the lines of communication between employers and educators frequently break down and that schools are not always responsive to the needs of employers.

In addition to two- to five-year projections of skill needs, local employment offices normally prepare employment anticipations during the forthcoming two to four months. These are also published and available to educational authorities. Another source of information about area skill needs has become available as a result of the Manpower Development and Training Act. Local employment offices, usually in cooperation with vocational education facilities, in hundreds of areas throughout the United States have conducted about 3,000 surveys of manpower shortages in specific occupations during the past two years. If recent pilot job vacancy surveys conducted by the United States Employment Service, in cooperation with affiliated state agencies, should be continued and expanded, additional occupational data will be made available to educators and others.

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[4] Robert Ferber, Rai-Ruenn Chen and Fadil Zuwaylif, "Employers' Forecasts of Manpower: An Interview Study," *The Journal of Business* (July 1961), pp. 393-94.

CONCLUSION

This brief summary of published occupational projections suggests that a good deal of information is widely available to educational authorities for the purposes of planning future needs. Projections of broad occupational groups indicates general trends of manpower demand, and the *Occupational Outlook Handbook* pinpoints national needs in specific occupations. The latter also serves as an early warning signal, projecting future declines in occupational demand. Area Skill Surveys, though sometimes leaving much to be desired, supply additional information on future local market needs. Moreover, educational authorities do not live in a vacuum, and employers normally have proper channels for communicating with school authorities regarding their anticipated skill needs. Whether our school systems are sufficiently viable and flexible to make optimum use of the available data is not susceptible to a wholesale appraisal. We have thousands of autonomous school units whose performance and response to skill needs vary widely, and no indices have been designed to evaluate school effectiveness, nor does it appear likely that criteria for developing such indices can be expected. It is also doubtful whether school performance would be significantly affected by better skill projections. Planning for occupational careers in a free society is at best a difficult business. There is no guarantee that individuals will respond even to the most sophisticated prognostications.

It is frequently asserted that it takes at least 16 years to train a professional worker, and another three or four years must be added if a fully-fledged "certified" product with a Ph.D. is needed. Fortunately, educational planners do not need that much lead time. The "input" provided by the school system to produce the professional varies little during the first 14 or 15 years. The same spelling applies equally to the fledgling physicist and economist, and both can be served doses of Hamlet with equal benefit. Therefore, except for the last year or two of college, all that educational planners need to know is the number of units that they will service. The available data help provide this information.

To avoid the loss of caste inherent in the implied contentment with available data, it should be emphasized that further improvements and refinements in BLS projection data are desirable. The scope of these projections can be improved. The same applies, of course, to the crude techniques now being utilized in projecting local labor market needs. Also, as the demand for an ever-increasing number of skilled and professional occupations is becoming national in scope, better insights and data are needed about geographic patterns of labor mobility. As stated earlier, educational planning is largely a state and local function, but the skills acquired in our schools are frequently sold in the national market. Similarly, there is also a need for more information about patterns of occupational mobility.

The present emphasis on "breaking the chains of poverty" suggests also the need for developing new techniques and institutions to better educate the children of impoverished homes, so that they may have a base for subsequent development of skills, and to equip poor adults for employment in occupations which will help them to escape poverty. This places additional burdens upon school authorities in planning new curricula designed to motivate the poor to acquire skills.

The occupational projections also have implications for school authorities in the utilization of their staffs. Changing occupational needs require flexibility on the part of the instructional staff. Once a teacher acquires tenure, he is hired for life, but the subject matter that he teaches may become obsolete. Schools must plan not only to teach their students, but also to equip the instructors to change their curricula and even their discipline to keep pace with the changing demands for skills. Moreover, even the most precise occupational data will prove of little value unless teachers, counselors, and school administrators keep abreast of changes in the job market and relate these changes in a meaningful way to needed adjustments in curricula and in guiding students in career planning.

In the final analysis, an evaluation concerning the needs of more precise and detailed occupational projections for educational planning and other uses cannot be considered in isolation. The recent expansion of manpower, anti-poverty, and related programs has put heavy strains upon the available professional and technical personnel capable of planning and implementing occupational projections. And there is ample evidence that the demand for these skills will continue to expand in the years ahead. The desirability of allocating additional resources to occupational planning must therefore be weighed in the context of resources required by competing programs. It is not at all clear that occupational projections should be allocated top priority among the programs requiring the scarce supply of skilled personnel to do the job.

DISCUSSION

CURTIS C. ALLER
OFFICE OF MANPOWER, AUTOMATION, AND TRAINING

The response that one makes to the issue of occupational data and its use in planning depends in large part on the level at which one is operating, and for some years I've been operating on what I'd call the "underworld" of present-day academic life, that is, outside of the major universities. I have had an opportunity at the local level to participate in developing training programs and similar action programs in California, and I'd like to talk a little bit about some of our experience there.

Let me note that some years ago, when a number of us tried to start a manpower council in San Francisco, one of the things which defeated us was the fact that more or less simultaneously the state developed an interest in the problem of automation and in the possibility that it might begin to involve itself in manpower questions. We who were initially interested did the traditional thing: we passed the buck up to the next highest level of government. Later, when the state began to wrestle with these problems, they said, "Well, really, this is a federal issue." It's not easy to get back down to the localities, where the problems of putting the pieces together are enormously complicated.

Then there is the experience of the State Commission on Manpower, Automation, and Technology in California. The labor movement expected the Commission to come up with instantaneous solutions; the governor complained for months that the Commission wasn't giving him any recommendations he could send to the legislature and hence must be a waste of time. The most important thing that came out of the Commission's work, perhaps, is that after spending a year wrestling with its broad charter, it ultimately was forced to say that it could not begin to confront its problems intelligently until an adequate system of labor market information was developed on a sustained basis for the state. If you can't really work with problems, this is one way out, but I think it's an effective way out.

I've heard John Dunlop speak on occasion about our insatiable need for more data and about the tremendous growth in available data we've experienced in the last thirty years. Yet when you work at the local and state levels, you discover that what we have isn't sufficient. The Commission received repeated requests from the education people in the state for assistance in the general area of educational planning. As a result, it wrote to Max Rafferty, our Superintendent of Public Instruction, in part as follows: "Acquiring adequate information about jobs is, however, an expensive and arduous task. Even reasonably valid long-term projections of labor needs by occupation, whether national, state, or local, depend on much further refinement of techniques still in their infancy. Acquiring the vast mass of quantitative data concerning entry into various occupations and the qualifications required of applicants, and so on, is complicated. The validity of the entire structure of information underlying satisfactory counseling and guidance material must be continuously checked and revised. All of this is expensive."

The rest of the letter says, in effect, that before it goes forward the Commission must know how serious the education people are about the need for this information, by posing a number of questions. For example, what information on the occupational and industrial structure of the state and its major labor market areas does the school system require for short-range, medium-range, and long-range planning in curriculum development? Second, in what format should these data be presented? Third, what kind of occupational labor market information does the school system require for adequate counseling and guidance? And so on. The state education agency wrestled with this and came back with eight specific responses. First, it said, it needed information on current occupations. This, it argued, is of the highest priority, and local data are the most urgently needed and the most lacking. Information on the entry level of jobs in the communities for youths who have no more than a high school education or who are dropouts, including data on minimum abilities required by employers, constitutes a special need. Predictions of job opportunities are needed on both a short-range (up to five years) and a long-range (up to ten years) basis. Labor market information should be based on what is, not on what was.

Also noted as needs was information on new and changing occupations; about educational and training requirements; on changes in knowledge and skills required of workers; on families of occupations requiring similar patterns of abilities and interests; on long-term trends, national and state, in major occupations and industries; on specific occupations that will employ large numbers of workers, male and female, in the future; and on future working conditions affecting school programs. The agency concluded that this listing indicates that educators are aware of the serious needs. Moreover, it was emphasized that the freedom of the student to choose a course or a career can be as effectively abridged by inadequate information as by external coercion. And consequently, they are seeking as much information as possible.

Second, and this may be more important, the Commission passed a series of recommendations on March 28, 1965, calling for the development of a labor market information system for the state. Let me remind you that the state has 18 million people now; the senators who are wrestling with the question of reapportionment and the concern about the shift of power to Los Angeles have suggested that California be split up into two states. One of the interesting reasons for doing this is that the government of the state of California, with a budget of over $4 billion a year, is larger than the governments of most countries of the world and so has become too complex. The Commission is suggesting that an economy of this magnitude and complexity really requires a full battery of labor market information, as well as other kinds of data.

They have proposed a series of recommendations of what California needs. First are labor force projections; second, industry and occupational studies; third, job vacancy data; and fourth, a quarterly report on the labor force. For California alone, this would cost about a million dollars. This is a sizeable sum of money, and yet, as the Commission points out, all of the planning activities of the state—for schools, highways, etc.—require this kind of basic information.

There is also an administrative recommendation, that is, to direct the Department of Education to submit to the government and to the Commission an annual report on manpower data requirements, which will contain an evaluation of the adequacy of the state's manpower information program to meet the needs of the total California school system, as well as recommendations for the improvement of the manpower information program in relation to these needs.

But will the school use this information? We need something which focuses the schools' attention, at the highest level, on the information needs and the uses to which it's being put. If something of this sort isn't done, then the failure to use the data is almost predictable. This, I suggest, is the nub of the question we face. Discovery of what kind of information actually is required for effective educational planning in a locality or region is part of the problem. More important, perhaps, is the discovery of how the new information can be successfully utilized.

NEIL W. CHAMBERLAIN
YALE UNIVERSITY

Sar Levitan has given us an excellent review of occupational forecasting programs, but I confess that he has not helped me, any more than the meeting this morning, to achieve a sense of focus of this conference. I'd say that Sar has managed to perpetuate right to the end the sense of diffusion which seems to surround a lot of our deliberations here. I think that, to a considerable extent, this arises from our failure, perhaps our inability, to come to grips with what we are talking about when we speak of educational planning. We've discussed it in a variety of forms, never with any general agreement that we were focusing on a particular form at any one time. There are at least three ways in which we have used the term, it seems to me. In one sense, and Sar uses this one in his paper, we've looked on educational planning as including vocational counseling. From another point of view, we have taken educational planning to refer to—at least to embrace, if not to be confined to—vocational training of a rather specific type, epitomized by apprenticeship. We've talked about training programs for plumbers, for electricians, and so on. At other times we have talked about educational planning as relating to general education, the broad area of education which is intended to have some kind of cumulative or sequential buildup of a person's knowledge over time, in both depth and breadth. With respect to each of these, it seems to me that the kinds of occupational data that would be wanted or usable are likely to differ, that for some purposes projections will have relatively little meaning, while for others they'll have good use. We've spent very little time on the question of occupational data with respect to the content of jobs, and yet it seems to me that this is an area which needs a great deal more emphasis, particularly when it comes to the matter of general education.

As far as my own remarks are concerned, I'd like to exclude any consideration of vocational guidance or vocational counseling—I'm not sure that I'd want to include these in the education planning framework. I'd relate that more to labor market performance. I can see where, for purposes of administrative convenience, you might want counselors located in school systems or in school districts or in particular schools. But I'm not sure that I'd want to dignify that, or at least think of that as involving educational planning, unless one means educational planning for an individual. Nor am I particularly interested in the kinds of specific training programs that might be developed and that would not have a necessary or potential to general education.

I am much more interested in a focus on general education extended over a period of time—we are increasingly thinking now, throughout a person's lifetime—and addressing myself to the question of what kind of relationship there is between that type of educational planning and occupational data. And that seems to me to be a significant question that needs a lot more attention, where we as a society could profit a great deal from boring in on that issue.

Even if we look at the question of general education, there appear to have been two more or less distinct points of view emerging in the conference. One of these considers education to be a kind of derived demand. Looking ahead in our kind of consumer-oriented society, we posit some final bill of goods and services which would be wanted at some date, given changes in the availability of products and in tastes; and then we say (in the light of changing technology, which have their effects on manpower uses) what manpower would be needed to produce this final bill of goods and services. What manpower is required in terms of the kinds of occupations and in terms of the number of people in those occupations? And that, then, becomes the demand for which schools are expected to be guided in planning their curricula. That introduces the philosophic dilemma which we've touched on a number of times, the question of how you use that kind of approach in a decentralized economy, with a decentralized school system, and when we are trying to afford freedom of choice to individuals in making their own jobs.

While it's not an easy question to come to grips with, I don't think we've really faced up to it. All of us can agree that we want to strive for freedom on the part of individuals to make their own choices, and we're not going to worry too much whether there's an oversupply or an undersupply of particular skills—we hope that these things will get adjusted either by market pressures or by adaptation. But I would agree with Herb Parnes' comments this morning, that this is a position we cannot assume dogmatically. If there are some kinds of occupations or professions which we are inclined to think are essential to the ongoing nature of our society, we do give special emphasis to them, perhaps in the form of special fellowships or financial advantages or other such inducements to go into them. Health might be one: we would see the necessity of encouraging more people to equip themselves to cope with the ample problems of public health, mental health, etc. At least with respect to these strategic kinds of occupations and professions, we have to be prepared to make judgments and to create inducements that, while still leaving the free choice of individuals in the light of those inducements, are designed to mobilize social pressures to achieve some over-all social objectives. But it would be primarily with respect to a limited number of these types of decision that we would be doing that, and on the whole we leave a good deal of flexibility and freedom without special inducements to individuals.

But there are issues here—where you draw the line, how far you go in this direction—that really need some attention and resolution, and we really didn't come too close to progressing with that.

The second point of view would tend to divorce general education from any kind of occupational needs on the part of society as a whole and would look on education as being guided primarily by principles of good citizenship. The intent would be to develop the best in people, perhaps thereby incorporating the occupational interest to the extent that Jack Kaufman was arguing for, that is, increasing the flexibility or adaptibility of people by giving them certain basic skills; but this is not really related to any kind of occupational approach. He leaves the choice entirely up to the individual. For that kind of approach we wouldn't need any occupational projections, and that seems to me to be the point of view that has tended to characterize this conference.

I share this view up to a point, but it's just at that point where I'd like to raise this question about occupational data, in the sense of *content*. It seems to me that one of the things that would be highly desirable for us to do would be to look at whether, in fact, more of a bridge needs to be built between the world of education and the world of economics (to use the term that Fred Harbison has used). If we look at all the changes which are being introduced into economic activity—technological changes, new knowledge affecting the way old jobs were being done or creating a whole new spectrum of jobs—do we not need to make a lot more use of that kind of information? Can the knowledge which underlies such occupational changes be made an integral part of the educational process? There is room here for a good deal of experimentation. We have no reason to believe that even at grade 4 or grade 5 you couldn't introduce youngsters to some notion of some of the elementary principles behind the things an electrician does. But that becomes merely the base on which to build a much more developed and detailed kind of information, leading into a study of electricity and physics generally.

In similar fashion, there are many ways in which you can introduce the content of other occupations, giving an insight into what these are about—and then making this the bridge, if you will, or the basis on which you go on to develop, at some stage, the latest refinements, the latest knowledge, the improvements in analytical tools and content. Here I suspect that our schools are quite delinquent, and perhaps not through any fault of their own. This is a demanding kind of assignment—to keep up with the kinds of changes that are taking place in the world around them. For example, we're all familiar with the way in which computers are affecting a variety of activities all around us, to the extent that they are modifying many kinds of social relationships. It seems to me that this kind of technological comprehension, affecting the occupational component in our society, could be introduced into early educational training. Out of a study of all of the elements that go into the mechanics and electronics of computers, along with their social applications, students would begin to develop a sense of a world of work, along with a rather vigorous development of their own intellectual capacities. This would constitute an effort to inject into our educational mainstream a substantial occupational component, not specifically for learning a trade or a job, but rather as the basis for building a broader education. Or at the other extreme one may take certain kinds of knowledge that are being developed and show how these, in fact, are helping to build a new kind of economic society around us—how some of the discoveries in physics, in chemistry, and so on, are actually being put to work in a variety of ways, so students have some sense of economic reality around them, a kind of sense which, I might say, a great many students do not have even when they graduate from college. We are all aware of the *naiveté*, on the part of many of our students, when they graduate from college, with respect to the actual world of economic activity around them.

What I'm suggesting is that if somehow we could make that world the base on which they build their education, this could be a kind of occupational orientation of a very high order indeed. And it would contribute to the kind of flexibility and adaptability which Jack was urging, helping to foster an ability to fit themselves into a society which is changing around them at a rapid rate.

There's no reason to believe that by incorporating this kind of occupational component into our educational mainstream we're likely to short-circuit the cultural activities. The more that one can develop the intellectual vigor of an individual, the more likely that this will spill over into all areas and not be confined to any single one. Nor am I worried that this is likely to mean that we are going to improve our labor force to the extent that individuals will not find the proper outlets for their abilities, because they will have been overtrained. I have a reasonable faith that, just as some people in the last century argued that demands will adjust to supply, so it is likely that the development of this kind of labor supply will have its own effect on the kinds of jobs available. To the extent that we can improve our educational system, by graduating students who are sophisticated with respect to the intellectual background and derivations of the occupational content of jobs, they will themselves stimulate the development of technological innovations, spurring on the kinds of improvements that make ours a most aggressive society.

It also seems to me that this kind of thing has great possibilities for encouraging one of my special interests, namely, the continuity of education over one's lifetime, throughout the duration of his career. At the point when one graduates from high school or college, or at whatever point he leaves school to go into a particular job, he recognizes that the content of his job is going to be changed, and it will be changing because of the development of new knowledge, and that it is not sufficient to rely on retraining programs that are simply designed to give him new skills. We should try to develop in such individuals an understanding of the intellectual development, the knowledge development, which led to these changes in technology to which he has had to adjust. It is not simply a matter of skill retraining, but really a knowledge addition, a knowledge supplement, something further to build on.

This is the kind of thing which I would call the occupational component of education. For this sort of thing we need a lot more data, particularly our teachers. All of us who are in the teaching profession know how difficult it is to keep abreast of these kinds of developments—to see how they affect the applicability of the things that we are teaching. In some fields it is more difficult than in others. But that kind of an approach seems to me to be one that is highly desirable. Here one could make really important advances in terms of the relevance of occupational data for genuine educational planning.

VLADIMIR D. CHAVRID
OFFICE OF MANPOWER ANALYSIS AND UTILIZATION

I have noted with interest the paper Dr. Levitan has presented evaluating occupational data and their use in education planning. He has called attention to difficulties involved in providing the long-range occupational forecasts necessary to the design of effective vocational education programs. However, it would appear that some of the examples he has chosen to illustrate his remarks are inconclusive. For instance, he apparently considers ill-founded the forecast made in 1962 in a Philadelphia Area Skill Survey[1] predicting a sizeable local shortage of policemen, firemen, and watchmen and a surplus of barbers and beauty operators in 1967. As a matter of fact, the Employment Service agency in Pennsylvania recently reported that unfilled demand for policemen, firemen, and watchmen is now on the rise in Philadelphia, and that increases in wage rates are being considered in order to attract more workers to these jobs. At the same time, although highly experienced beauty operators continue to be in demand, the schools and the Employment Service are having difficulty placing new graduates trained in this occupation.

Certainly, we in the United States Employment Service recognize the need for further refinement of techniques for occupational forecasting. Work on such refinements, as well as explorations into new and improved techniques for this forecasting, are part of the occupational information program of the Federal-State Employment Service system. This program plays a significant role in extending the effectiveness of the nation's manpower programs and in the day-to-day operations of the public Employment Service system. I should like to take this opportunity to describe the various aspects of the program, and to report on the steps we are taking to improve its usefulness.

Our occupational information program is closely related to the growing awareness of the role of manpower in the economy. Our nation has accepted the challenge to provide the skilled manpower resources our expanding economy requires, to broaden the employment horizons of our work force, and to reduce unemployment. To achieve these ends, we are committed to increasing job opportunities, to improving the employability of our workers, and to linking the two—jobs and workers—more effectively.

With the quickening tempo of national manpower programs, the need for adequate occupational supply-demand information increases. An understanding of local occupational needs and an assessment of community manpower resources are required for the development of meaningful manpower training and vocational education programs. At the same time, occupational information on a national and local basis is also required for effective matching of jobseekers to available job opportunities. The public Employment Service system has made, and is continuing to make, major contributions to the development and dissemination of the necessary occupational information.

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[1] Commonwealth of Pennsylvania, Bureau of Employment Security, *Manpower Skill Requirements and Training Needs: Philadelphia Labor Market Area 1962-1967* (November 1962).

The Federal-State Employment Service system, with its nationwide network of over 1,900 public employment offices, to which are now being added 133 Youth Opportunity Centers in major metropolitan areas, is a focal point for government and community efforts in carrying out the provisions of the manpower legislation of the 1960's. The basic day-to-day operations of these offices are the source of occupational data necessary for increasing the employability of the individual and for the matching of workers and jobs—prime responsibilities of the Employment Service.

Two of the major operating tools developed by the Employment Service to carry out its responsibilities have achieved universal acceptance: the *Dictionary of Occupational Titles*, for the listing and analysis of occupations, and the General Aptitude Test Battery (GATB), for the selection of workers for specific jobs or training.

CODIFYING JOBS

Since its initial publication in 1939, the *Dictionary of Occupational Titles* has offered to the Employment Service and to counselors, educators, personnel administrators, and employers at large a new and unique operating tool. The dictionary also provided a definitive basis for the development of the statistical tools related to occupations so necessary for the implementation of manpower programs. The third and newest edition, now on the presses, defines some 22,000 occupations and contains some 6,000 jobs new to the dictionary and prominent in the current economy.

This new edition of the dictionary is of particular importance and value because of the rapid changes taking place in the economy. New jobs are coming into existence, and old jobs are changing or becoming obsolete. The new DOT provides a comprehensive listing of current occupations, together with an analysis and description of each job, what it involves, and what traits it requires of the worker.

Also, this third edition differs significantly from the last edition published in 1959. Not only has it been extensively revised, but for the first time since the 1930's the job description content has been completely verified. The new edition represents more than a quarter-century of gathering information and developing and perfecting techniques for conducting occupational research and analysis.

New features incorporated into the forthcoming edition will be especially valuable as counseling tools in broadening the job horizons of disadvantaged workers and new entrants into the job market. One innovation is a new classification structure which supplants the two structures formerly used. The new structure has two arrangements of jobs: the Occupational Group Arrangement, which groups jobs by occupational and work factors, and the Worker Traits Arrangement, which groups them by worker traits and requirements.

In the Occupational Group Arrangement, jobs are assembled according to broad occupational categories somewhat similar to those in the present edition. It identifies separately such groups as professional, technical, and managerial; service; and clerical and sales occupations. However, former categories relating to skilled, semiskilled, and unskilled disappear, and are replaced by groupings related to work site or type of work—e.g., benchwork or processing occupations. Groups are based on some combination of subject matter, material, product, service, industry, and work field purpose.

Within these groups, occupations are arrayed according to level of complexity. In any one group, jobs may range from foreman all the way down through the skill structure to laborers. Data are thus provided in the form of a "career ladder," pointing the way to entry opportunities for which workers can most easily qualify, along with the progression possibilities existing within any one field of work.

In the Worker Traits Arrangement, jobs having or requiring common worker traits or characteristics are brought together. This consists of 22 broad areas of work, such as artistic, clerical, and machine. These broad areas contain some 110 worker traits groups, such as inspecting and stock checking within the clerical area, and photography and motion picture camera work within the artistic area. The groups within the broad areas include jobs having common worker trait requirements and contain a wide variety of occupations, all involved at the same relative level of complexity. Also, a profile is presented for each group showing training time, aptitudes, interests, temperaments, and physical demands.

IDENTIFYING TALENTS

While the new structure of the DOT provides greater flexibility in the classification and counseling of disadvantaged and vocationally inexperienced persons, a prerequisite to meaningful classification is the uncovering of the job-seeker's latent talents through testing. However, we have discovered that some of the culturally deprived persons most in need of counseling and training lack the basic literacy skills necessary to participate in the established GATB program—or for that matter, other testing programs. Yet these are the very persons who, to become employable, are especially in need of testing, counseling, and training.

Consequently, we have undertaken research aimed at the ultimate development of a nonreading edition of all of the tests in the GATB. Already in use is a nonreading measure of general learning ability to assist in identifying the aptitudes of disadvantaged applicants. This measure may extend the utility of the GATB to the evaluation of the vocational potential of individuals regardless of their education and to an assessment of the amount of literacy training they may require, and may be capable of, as a prerequisite to vocational training.

JOB OPPORTUNITIES INFORMATION

To relate worker potentials to specific training and job opportunities, the public Employment Service has been expanding efforts to measure current and estimated future manpower needs by occupation, labor area, and industry, through Area Skill Surveys, Training Needs Surveys, Occupational Guides, and Industry Manpower Surveys currently being recast to take on the characteristics of industry skill studies.

Among the tools currently available to obtain occupational information for use in designing training programs, for counseling in the local public employment offices and in the schools, and for establishing community development programs is the Area Skill Survey. This basic occupational document for the community is a focal point in the evaluation of local manpower needs.

Area Skill Surveys are designed to provide comprehensive information on current employment and anticipated manpower requirements in selected occupations, in a given locality, statewide, or for major geographical areas, for periods up to five years. Projections are based primarily upon expectations of representative employers regarding their occupational labor requirements. Comparison of the expected labor demand with the expected labor supply permits the calculation of net shortages and/or surpluses by occupation and provides the basis for Employment Service operating programs, for establishing training programs, and for curriculum planning.

Experience with this program has made it possible to develop variations in approach which may improve the quality of the occupational forecasts and reduce the cost of such studies. These changes are being incorporated into a *Handbook on Job Market Research Methods, Area Skill Survey*.

To date, 45 states have participated in the program; more than 160 surveys have been published, 28 are in progress, and 28 are in the planning stage.

The Vocational Education Act of 1963 requires the Employment Service to provide occupational job market information to the state vocational education systems. Area Skill Survey techniques, although not designed specifically for this purpose, do provide the comprehensive occupational analysis and long-range forecasts necessary for the development of education programs and curricula in the vocational education system.

These surveys have stimulated apprenticeship programs and guided the formulation of school training curricula and industry training programs. For example, the results of the *Georgia Skill Study*, presenting data on 155 occupations, are the bases for determining the curricula for that state's vocational-technical schools, as well as for an expansion of the system to 28 area schools—of which 12 are already in operation.[2]

Similarly, the *North Carolina Study of Technical and Skilled Manpower*, published June 1962, provided the State Board of Education, which cooperated in the study, with guidelines in planning curricula for expanding vocational education programs to meet the needs of North Carolina industry. Data from this survey were incorporated into *A Guide to the Further Development of Industrial Education Centers in North Carolina, 1963*, published by the North Carolina State Board of Education.

The Training Needs Survey, an abbreviated Area Skill Survey, has been utilized successfully where speed is essential in identifying occupations for training under the Manpower Development and Training Act and the Area Redevelopment Act. The kinds of occupational information developed vary from survey to survey, but most include two-year estimates of labor supply and demand pertaining to a specific occupation or to small groups of related occupations. Some 3,000 Training Needs Surveys have been completed since 1961. Ordinarily these are not published, although the findings form the written justification for the establishment of each course.

Occupational guides prepared by State Employment Service agencies provide a concise summary of the job duties and employment prospects for a single occupation or group of occupations in a particular area or state. These guides, of which over 1,500 have been prepared by 30 state agencies, contain information on the characteristics of the occupation, such as the nature of the job, training time required, method of entry and promotional opportunities, and on the economic aspects such as current and anticipated employment opportunities and wages.

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[2] *Employment Service Review* (May 1964), pp. 28-30.

OTHER USEFUL PUBLICATIONS

Guide to Local Occupational Information, periodically updated by the U. S. Employment Service, lists published Occupational Guides, cross-indexed by occupation and by area, and Area Skill Surveys. *Job Opportunities Information*, a four-page flyer, lists Occupational Guides, Area Skill Surveys, and published Training Needs Surveys—either completed, in progress, or in the planning stage.

The Job Guide for Young Workers, a biennial publication of the U. S. Employment Service, provides concrete information on over 100 kinds of jobs open to inexperienced labor force entrants, and an orientation to the process of jobseeking and to the changing structure of our economy. It is a standard reference for Employment Service counselors and youth specialists serving young people leaving high school. It is widely read also by youngsters investigating vocational choices.

A new edition of the guide is now in preparation. It will include expanded information on job opportunities, both at the bottom of the skill ladder and at higher skill levels. Thus, the new edition will describe more of the kinds of jobs most likely to be within the grasp of young disadvantaged workers. At the same time, it will take account of the fact that technological change and other shifts in the economy have increased the demand for job market entrants with specialized skills for which some post-high school training is required.

The recently published edition of *Career Guide for Demand Occupations*, with information on 71 selected jobs, is a ready reference for counselors. It furnishes information about occupations that require pre-employment training and are of current interest because of present and anticipated demands for workers. It also serves, in part, as a basis for measuring the adequacy of community training facilities in schools and on the job, and for promoting the development of such facilities where necessary.

Planned for release this summer is a new edition of *Health Careers Guidebook*, which was prepared by the U. S. Employment Service in cooperation with the National Health Council. It contains information on education and training requirements for more than 200 occupations in the health field. It also gives pertinent information prepared with the assistance of the Bureau of Labor Statistics on earnings and employment prospects of these occupations.

ES OPERATING DATA AS A MEASURE OF OCCUPATIONAL REQUIREMENTS

Clues to job opportunities lending themselves to both long- and short-term skill training are also available from the regular flow of activities in the Employment Service local offices. More comprehensive information can be developed by examining data on unfilled job openings at the public employment offices, particularly those unfilled for 30 days or more, on job orders cancelled, and on locally hard-to-fill openings placed in interarea recruitment through the Federal-State Employment Service system.

Results of the special survey of openings at the end of July 1964 and published in February 1965 revealed that a significant number of the jobs unfilled for 15 days or more were of the kind that would be suitable for disadvantaged workers. Some 3 percent of these unfilled jobs were in unskilled occupations; 12 percent in semiskilled; and 15 percent—with a large proportion of openings suitable for unskilled and undereducated workers—in service occupations. Of course, as would be expected, the bulk of the unfilled openings were in professional, semiprofessional, and skilled occupations.[3]

There is substantive evidence that unfilled job openings listed with the Employment Service offer a representative measure of the occupational characteristics of unfilled job openings in the community as a whole. For example, analysis of the returns from the initial reporting areas in the first round of experimental Job Vacancy Surveys conducted by the Department of Labor from October 1964 through January 1965 showed that jobs available in the local economy were generally the same types of jobs for which the local Employment Service offices held unfilled job orders. On the basis of these early data, it appears that between 25 and 30 percent of all local job vacancies are listed with the Employment Service, and that there is a relatively close correspondence between the occupational needs reflected in unfilled job openings held by the Employment Service and total job vacancies.

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[3] *Unfilled Job Openings with the Employment Service* (Department of Labor, February 1965), p. 9.

Consideration is now being given to the establishment of regular reporting of detailed information on unfilled nonagricultural job openings listed with the local public employment offices for a month or longer. This detail will also indicate whether the jobs are unfilled because of limited applicant supply, or other factors such as unreasonably high employer specifications, relatively low wages, or other unfavorable working conditions. Consequently, these data would provide valuable indicators for skill training and placement.

SOME MAJOR PROBLEMS AND POSSIBLE SOLUTIONS

As we work toward the goal of meeting today's need for comprehensive occupational job market information on a local area basis, we are concerned with several major difficulties. Experience in making local long-range occupational forecasts has brought to the forefront the following problem areas: (1) a number of factors directly related to production complicate the employer's task in making estimates of his future employment needs; (2) most projections present only the demand side of the labor force equation, and are frequently lacking an estimate of supply; (3) the techniques used and the data developed for national projections pose a number of difficulties when reviewed for the purpose of local application; (4) there are no current benchmark data for detailed occupations against which projections may be evaluated.

Prompted by the critical need for long-range local occupational forecasting in the establishment of community programs, the U. S. Employment Service is currently attempting to resolve these problems. In addition to a number of important modifications to improve the Area Skill Survey methodology we have recently completed arrangements for an appraisal of the accuracy of employer forecasts and the use made of the findings of Area Skill Surveys in two areas by a private economic research consultant.

Another step recently taken by the U. S. Employment Service is the establishment of an agreement with the Bureau of Labor Statistics for a cooperative effort to develop a methodology for adapting national occupational forecasts for local use. We are also actively encouraging research in techniques of long-range forecasting by the State Employment Services, and are following with great interest similar research contracted for with universities by the Office of Manpower, Automation and Training and the Office of Education.

In assessing these efforts, we recognize that a number of additional elements are necessary to strengthen the USES long-range local occupational job market information program. These include:

(1) A relatively current benchmark or inventory of employment by occupation for each of the country's 150 major labor areas—to be updated periodically, perhaps every two years. These data would provide the necessary base from which local long-range forecasts would be made.

(2) A detailed analysis, for each of the 150 major areas, of relatively long-range (two or five years) occupational requirements in relation to probable supply. These studies should be prepared locally and should include data both from local employer forecasts and from national projections. The proposed cooperative BLS-USES effort relating to long-range occupational projections should represent a useful adjunct to currently available tools—and others now in the developmental stage—in improving the forecasts made under this phase of the USES program for obtaining long-range local occupational information.

(3) Techniques for keeping these data current. To keep abreast of changes in the local employment structure, by occupation, as they occur, on a quarterly basis, use should be made of local office operating data, particularly job openings, and new programs such as job vacancy information.

(4) Utilization of these occupational labor supply-demand data in preparing counseling and guidance material for workers entering the local labor force or making midcareer job changes.

(5) Additional occupational job market research. This includes improved techniques for measuring the impact of technology on industrial and occupational structures and for

obtaining and evaluating supply data by occupation in local areas. The eight occupational research centers of the Employment Service system, staffed by skilled occupational analysts and fresh from thousands of employer contacts gained in compiling the third edition of the *Dictionary of Occupational Titles*, are an ideal resource to study the occupational impact of changing technology. Also needed is an improved method for obtaining and evaluating supply data by occupation in specific areas; particularly, more precise information on the impact of geographical and occupational mobility.

(6) A planned follow-up program to appraise employer forecasts and verify the effectiveness of Area Skill Surveys in meeting local needs.

Programs to gather and analyze local occupational information are costly because of the detail and difficulty involved. Yet the need is great and the goals must be met. Hundreds of millions of dollars will be spent on training. But greater by far is the value resulting from the fuller utilization of the skills of the nation's work force and personal satisfaction accruing to individuals who have found fulfillment in their job choices.

JOHN T. DUNLOP
HARVARD UNIVERSITY

There are several additional points I should like to add to the discussion. First, no one should leave this meeting and suggest that substantially improved occupational data are unnecessary, apart from their use in educational planning. The need for more detailed, better related and higher quality occupational data on employment, education and wages—as well as occupational data by various other labor force characteristics—remains at the very top of our statistical priorities. While improved occupational data is not the subject of our meeting, some of the discussion has tended to overlook the wider needs for occupational information in general economic analysis and policy prescription.

Second, there is need to recognize the wide variety of types of educational planning, private and public, that take place and that the need for occupational data varies widely among these types of planning. Further occupational detail may not be necessary for educational planning for general enrollments in high school or even college enrollment. These enrollments may be shaped by a variety of cultural and economic factors without very much direct regard to the detailed occupational structure of employment opportunities. But there are a variety of other specialized educational programs for which detailed occupational data are most relevant.

Many of the most interesting and important projections of manpower requirements are being made by private companies and operating governmental agencies. Earlier this year, for example, in cooperation with the National Industrial Conference Board, I met with a group of company representatives who use detailed manpower projections in their operating planning for three months forward, one year forward, and even in some cases for five years forward. We were interested in exchanging views about methods of making and using projections of manpower by occupations. A lot of effort and imagination is going into these projections, and they are used for a wide variety of operating purposes. Aerospace companies, for example, need data on the very detailed occupational specialization of their engineering and research staffs stored on computers in order to determine quickly whether they have the manpower to bid on certain types of government contracts. The specialization by subject matter and research topic is very narrow. These data have been used, further, to go to the local school systems and vocational institutes to indicate a need for specialized types of courses for technicians and other specialities. These needs can be ascertained several years in advance, and instruction can be developed to train the needed manpower. In other cases, the manpower projections are more gross and are simply the manpower implications of production and capital budget planning. At times these implications are developed only at the management level, in terms of college and professional recruitment, and at other times the implications are developed for the full range of employment.

It is my thought that ten or twenty years from now we should be able to have manpower projections by occupations from large private enterprises in the same way that we now have regular estimates of projected outlays on plant and equipment. Indeed, it is my hope that the National Industrial Conference Board, may be interested in developing such estimates as a natural outgrowth of company projections of manpower needs combined with the existing data on projected capital outlays. These plant and equipment projections have manpower implications that need to be developed. Supplements could be added to the existing capital outlay questionnaires. Such manpower projections could become one of our most significant economic indicators.

Let me give another example of the importance of improved data to manpower planning in the private sector. I refer to the importance of manpower projections by craft in the construction industry for the recruitment of apprentices, including the problems of minority groups. Estimates of manpower needs by craft in 1970 or 1975 are very significant to these decisions. Our data, our techniques and our procedures for making these projections need to be improved in cooperation between labor, management, and government.

Mr. Swerdloff, who is here with us today from the Bureau of Labor Statistics, knows a good deal about the efforts in this direction. I have been meeting with a group of labor and management representatives from various branches in the construction industry, and with the Bureau of Labor Statistics staff, to improve our projection estimates. This effort is important, it seems to me, since in the past there has been most serious conflict over such estimates. Past government estimates were denounced by convention action. It should be possible to reach technical agreement on a range of estimates by craft for the future, particularly when the various assumptions and methods have been specified in detail. Such estimates involve detailed discussion of unemployment rates, retirement and exit from the craft, seasonal patterns, hours of work, rates of technological change by branches and crafts, and the shifting composition of construction output. An agreed-upon set of projections for the future, or a range of projections, can provide a most fruitful framework in which labor and management representatives in particular areas, and national committees by branches of the industry, approach the questions of deciding on the number of apprentices and manpower specialization. These projections are important to vocational education planning.

Third, I have a more optimistic view than reflected in much of the discussion, concerning both the importance and the possibilities of using occupational data in various types of private and public educational planning. In the future I foresee a great deal more attention paid by the parties to collective bargaining, and by large scale managements where there are no unions, to retraining and upgrading of the work force at all levels on a regular and continuing basis. Our work force must be more versatile and more broadly trained while in employment, if it is to escape from some of the most serious problems that arise when jobs are lost and occupational shifts are imperative. Each employee should participate in an educational program on a regular basis of once every several years as a matter of course. In such a world more detailed occupational data with educational and training requirements are essential. We must get used to the idea that in our pluralistic society a great deal of educational planning is done outside the government, by labor and management and by households. It is a governmental function to improve materially the quality of the data and the techniques of aggregate projections.

MYRON L. JOSEPH
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In the 1965 Manpower Report we are told that the Department of Labor anticipates the development of "increasingly detailed industry and occupational projections—with analysis of the probable balance between requirements and resources in major fields of work as an ultimate objective."[1] With this as preliminary background, I would strongly concur with Professor Levitan's position that "it is not at all clear that occupational projections should be allocated top priority among the programs requiring the scarce supply of skilled personnel to do the job."[2]

This view is based in part on the feeling that the need for detailed occupational projections is not obvious, and, more importantly, it is based on the belief that we have not yet developed a satisfactory framework within which the projections now available can be used effectively. The more detailed the published projections the easier it will be for them to be used inappropriately.

The focus of current occupational projections too frequently appears to be on forecasting manpower *requirements*, so that they can be analyzed in terms of the available resources. The usual implication is that if resources do not meet requirements, something should be done on the supply side to remedy the situation.

If we had specific output requirements that had to be met (e.g., for defense purposes), and if the occupation mix required for that output was fixed, it might be appropriate to talk in terms of an imbalance between projected requirements and resources. But in general the pattern of demand is not fixed, nor is the most efficient occupational mix or the most profitable labor-capital ratio. Over a five- or ten-year period, the employment pattern will change as manpower supply and demand adjust to shifts in wages, costs, and demand. A sophisticated model of the economy, which would have to include as one of its equations the reaction of the economy to published predictions', may some day be able to predict occupational employment patterns. A better understanding of the labor market is a major requirement for the development of such a model. But the current occupational projections are not derived from an economic model. They are primarily extrapolations of past changes, modified by educated guesses about future trends, and are necessarily based on relatively fixed relative wage, cost, and demand assumptions. The use of these projections as a target for manpower planning assumes that the conditions on which the projections are based should not be disturbed. The possibility that wage or salary adjustments might equate supply to demand is ignored.

For example, in discussing the supply and demand for college graduates, the manpower report concludes "in some fields, persistent personnel shortages are likely unless specific efforts are made to increase the number of new entrants..."

(page 114). Neither at that point nor in the chapter on the manpower outlook does the report discuss the possibility that wage adjustments might change the occupational demand structure. The point of view throughout is that manpower requirements provide a basis for *supply* adjustments and indications of training and education needs.

My concern for the preoccupation with supply-side adjustments by those who generate and interpret occupational projections was evidently shared by the OECD examiners of U.S.

> It is apparent that a great deal of natural adaptability to changing labor demands occurs within the labor market and that workers, in fact, move from occupation to occupation both as a function of their natural desire to upgrade themselves in economic and social terms and as a necessary way of avoiding displacement due to changing occupational requirements. Education and training cannot be construed simply as the supply mechanism in an economy, which meets the demand requirements of that economy expressed in specific and rather stable occupational terms at future points in time.[1]

I cannot keep my academic license without agreeing that we should try to improve our ability to predict occupational employment patterns. But, again agreeing with the OECD Report, I believe that at the stage of our current knowledge a significant problem is "the development of concepts about the real objectives of such forecasting devices and especially to insure that fundamental research *is being* undertaken about labor market processes and technological change."

I would certainly agree with Professor Levitan's statement that "to the extent that occupational projections can help in vocational guidance of youth and in planning by educational authorities and various private decision-makers to implement programs for the years ahead, they can lighten adjustment burdens and usefully smooth the desired matching of the economy's occupational requirements and its manpower supply." The problem is whether we can provide "reasoned expectations about the future on which more rational and less risky decisions can be based, and thus reduce unnecessary mistakes in the utilization of scarce human and material resources."[3] I am apparently much more concerned than Professor Levitan seems to be that the technical shortcomings of Area Skill Surveys and other occupational projections (whatever happened to the shortage of engineers?) may lead to serious errors in planning by individuals and educational institutions. The longer the period of projection, and the more detailed its focus, the higher the probability of error. We should proceed slowly in the publication of shakier prognostications and provide better information about the limitations of those that are now made available.

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[1] OECD, Manpower Policy and Programmes in the United States (Paris 1964), p. 83.

Indeed, there are strong arguments against pushing in the direction of more detailed occupational projections. The probability that workers will make several occupational shifts during their work life increases the importance of detailed forecasts. The survey of 1961 job shifts showed that about 49 percent of job shifts by men and 44 percent of job shifts by women were to different occupations. In addition, the training for most jobs is still primarily casual or acquired on the job. Projections for such jobs would be of limited value. If we first define with care the real *objectives* of occupational forecasts, we might be able to concentrate the available resources on those objectives. For example, one use of occupational forecasts has been to stress the need for more education. But there is now considerable evidence that educational attainment is rising faster than job requirements. The BLS forecasts for 1965 reports that over the next decade or so, the number of workers with a college degree may roughly balance employer requirements for personnel with this level of training. "It is perhaps even possible that new workers with a high school education will be available to permit employers to upgrade the requirements for many positions now being filled with less than a high school education." And a recent study of the relationship between formal education and occupation concluded that "the educational upgrading of the population will very likely continue to be more rapid than the

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3. *Ibid.*, p. 82.

shift in occupational structure. Increasingly, the future supply of educated persons may make the gross level of educational attainment a necessary, but not a sufficient condition for occupational entry."[3] My point is not that we should slow down the educational pace, but rather that we should not rest our general education decisions on occupational projections.

My suggestions for improving the utility of occupational projections would include:

(1) Make the underlying assumptions, and error probabilities explicit. This might include separating projections into groups on the basis of dependability.

(2) Develop projections for broad classes of occupations defined in terms of homogeneous education and training requirements.

(3) Put more emphasis on projections of wages and earnings potential as the basis for manpower development decisions. The projection of so-called shortage of professional social workers at a low non-competitive salary level might not be an appropriate signal for accelerating training in that area, whereas a projected balance of supply and demand of an exceptionally high paid occupation might suggest a fruitful area for more education and training.

(4) Identify occupations that limit entry artificially.

(5) Publicize requirements of newly developing occupations that require extensive education and training.

(6) Emphasize the impact of a better educated labor force on the development of new jobs.

The messages that I get from Professor Levitan's excellent paper are that: (1) more and better information about future occupational requirements would be desirable, but the information should be used with due regard for its limitations; (2) the policy implications of projections should not be oversimplified; (3) public authorities are inclined to place too high a face validity on occupational projections; and (4) the development of more detailed occupational projections should be postponed until higher priority manpower policy needs have been filled.

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[3] John K. Folger and Charles B. Nam, "Trends in Education in Relation to the Occupational Structure," *Sociology of Education* (Fall 1964), p. 33.